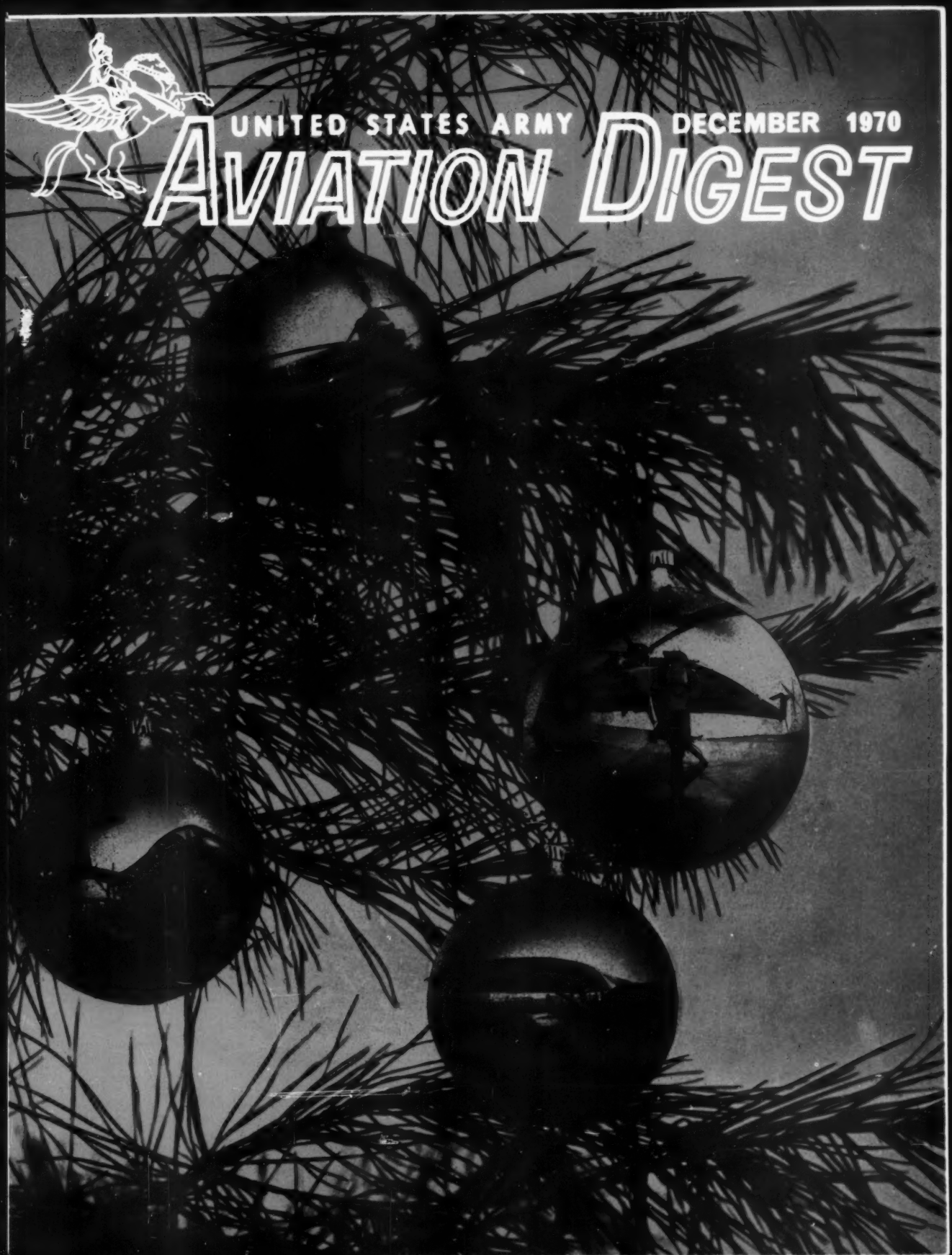
UNITED STATES ARMY
DECEMBER 1970
AVIATION DIGEST

UNITED STATES ARMY AVIATION DIGEST

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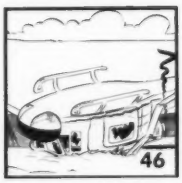

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ABOUT THE COVER

Our thanks to

CW4 Bill C. Walton

for cover photography

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, Ala. 36360.

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For those not eligible for official distribution or who desire personal copies of the DIGEST, paid subscriptions, $4.50 domestic and $5.50 overseas, are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

VIEWS FROM READERS

Sir:

I am writing in regard to the "Potpourri" article in the AVIATION DIGEST, August 1970.

After a year with a Cavalry unit, I find the information about revetments very interesting. Moving from base camp to base camp at the rate of once every 2 months or so, we were always faced with the decision to build our own revetments or take our chances, usually parking the aircraft in mud fields or in parking lots.

We finally found a revetment that can be built by five to ten men in a day's time. We stack up 16" x 16" timbers five high for UH-1s and three high for LOHs in an "L" shape. To prevent their demise by rotor wash, we drive in 5 to 10 8' engineer stakes on both sides to a level flush with the top of the revetment.

What I'm now wondering is how effective are these revetments? How much protection does 16" of wood afford the aircraft?

CW2 Richard L. Mathews
HQ, 1/11 ACR
APO San Francisco 96257

• The DIGEST referred CW2 Mathews' letter to the Department of the Army's Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss., and received the following reply:

The Nuclear Weapons Effects Division of the Waterways Experiment Station is currently engaged in a research project for the Office, Chief of Engineers to develop and evaluate revetment and overhead cover-type protective shelters for parked Army aircraft. Thus far, we have developed some designs for thin (12-inch thick) earth-filled revetments which should be easier to build and require less time and equipment to construct than existing thick (4 foot and more) revetments. These thin revetments have stopped all fragments from statically detonated 81, 82, 120 mm and 4.2-inch mortar, and 107 mm rocket shells detonated 5 feet away. The 122 mm rocket shells have not been tested at the 5-foot distance as yet, but the revetments have defeated fragments from this size weapon at a rocket-to-revetment distance of 10 feet. These revetments will be subjected to additional weapons effects tests as well as operational tests using several types of helicopters.

In addition to the work on revetments, we currently have under construction one 80-foot-diameter (for the CH-54) and two 20-foot-diameter (for the UH-1 and AH-1) arch-type shelters which will be covered with concrete and fitted with end walls and closures. These buildings are designed to withstand direct hits from mortar and rocket shells.

In regard to the inquiry from CW2 Mathews concerning his design for a timber revetment, our opinion is as follows:

a. It is believed that the 16-inch-square-thick timber (particularly if it is a hardwood) will defeat a great majority of fragments from the inventory of weapons we have tested. Our tests have shown that 2¼ inches of plywood is very efficient at stopping fragments at 30 feet and it appears reasonable to assume that the much thicker timbers should be proportionally more effective. If CW2 Mathews can describe the type of timber he is using, we can probably test similar timbers to determine the effectiveness of the material in defeating fragments.

b. It has been observed that the thin soil-filled revetments must be well supported and structurally sound or they will be displaced by the blast from the large shells such as the 4.2 inch or 107 mm and 122 mm even though they will stop the fragments. As CW2 Mathews has been building his revetments by stacking the timbers and anchoring them with engineer stakes, it seems possible that they may not be sufficiently secured or supported to resist the blast effects of a near-miss. Consideration should be given to supporting the timbers against timber or steel posts placed in the ground inside the revetment and pinning the stacked timbers together with drift pins. These modifications would cause the revetment to behave as a unit should a shell detonate at a close range.

We are very anxious to learn about the types of aircraft protective systems being used by units in the field. We know there are some very good ideas being generated and some which warrant further consideration and development. We appreciate this opportunity to advise and would like to make ourselves available to future problems which come to your attention.

Sir:

I am writing to ask the policy regarding the number of copies of the AVIATION DIGEST which an Army National Guard unit may request. . . .

. . . I feel the DIGEST is an important publication to Army pilots, whether active or reserve. As training officer for my unit, I'd like to put a copy in every pilot's hands if this is in keeping with distribution policy.

If you would be so kind as to tell me how many copies we can get, I will see that a requisition is placed through the state AG's office. Thank you very much.

CPT Jerome G. Bode, MSC
Arizona ARNG
8721 Placita Playa
Tucson, Ariz. 85715

• U. S. Army National Guard and Reserve units having pinpoint distribution accounts can obtain the DIGEST by submitting DA Form 12-4. The DIGEST office does not have any information concerning the various states' National Guard quotas. However, units are not to ask for more copies than are needed.

Non Destructive Inspections

Robert R. Brauer

Director, Aeronautical Engineering
Page Aircraft Maintenance, Inc., Ft. Rucker

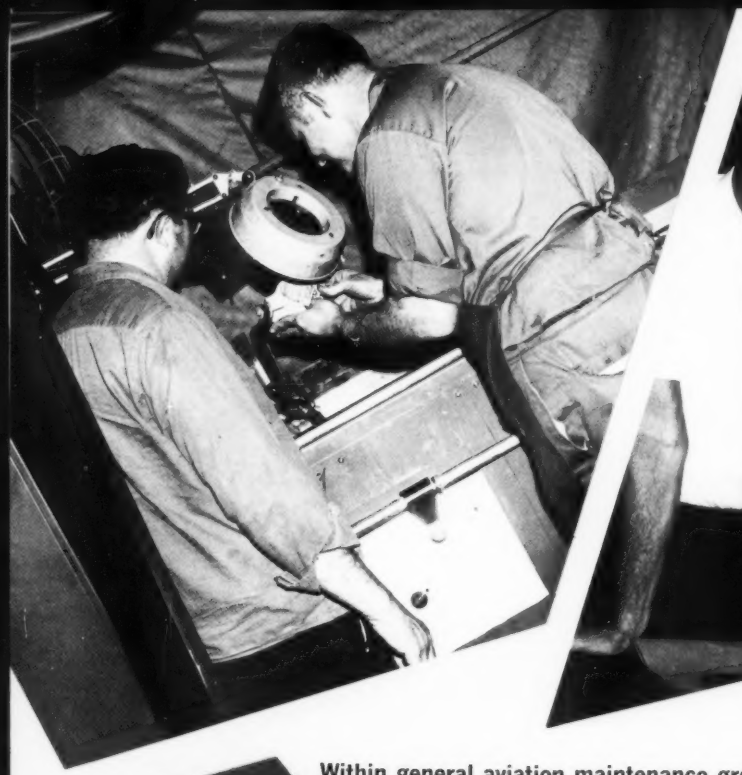
ONE REASON for the gigantic strides made in aviation safety over the years can be attributed to the intensive and painstaking research devoted to improving the accuracy of inspection methods.

During the 1930s it became apparent in aviation circles that new and improved inspection techniques were needed to keep pace with rapid technological advances. The necessity of non destructive inspections (NDI) led to the development of magnetic particle inspection for ferrous metals, and the flourescent methods of inspection for nonferrous metals. World War II brought an increased need for new advanced non destructive inspection methods. By 1943 aircraft production demanded even newer techniques including radiography and limited usage of eddy current inspection methods and even automatic inspection machines.

At first, these new and sophisticated inspection methods were generally confined to the aircraft manufacturing industry with very little emphasis being placed on their use in general aviation for routine maintenance of aircraft. But, during recent years the airlines and general aviation have taken a great deal of interest in new concepts and applied them vigorously to aircraft inspection. The results are obvious. The general public's acceptance and confidence in air transportation, both private and commercial, is a testimonial to the effectiveness of aviation safety achieved through modern systems of detection and correction which uncover faults that otherwise could not be found through visual inspection processes.

In the 1960s the military buildup in the Republic of Vietnam was paralleled by an equipment buildup at the U. S. Army Aviation School and Center at Ft. Rucker, Ala., which soon was operating the largest concentrated fleet of Army aircraft in the world outside of Vietnam. This spawned a need at Ft. Rucker for a reassessment of aircraft maintenance and inspection practices to determine their adequacy and seek improvements that would guarantee the required reliability and availability requirements. A study resulted in the development of non destructive inspection concepts and the acquisition of equipment that would detect faults or otherwise assure the airworthiness of equipment.

Aeronautical engineering personnel of Page Aircraft Maintenance, Incorporated (PAMI) at Ft. Rucker began in 1968 to develop methods and uses of NDI and to acquire the latest non destructive inspection equipment. Painstaking efforts and hundreds of hours devoted to research resulted in the successful use of ultrasonics, radiography, sound and vibration and eddy current inspection methods to



Within general aviation maintenance great strides to improve aircraft inspection methods have resulted in the introduction of an entirely new technique: non destructive inspection (NDI). Since the end of World War II, the ten revolutionary methods such as eddy current inspection and radiography were confined to the aircraft production industry. it is only recently that general aviation maintenance, stimulated by commitments to keep a burgeoning industry airborne, has begun to adopt these methods for use in the field. The result is that both the reliability and speed of the inspections have been immeasurably enhanced. Another notable consequence is the elimination of tedious hours of disassembly and reassembly which has greatly increased aircraft availability and dollar savings. Some of the inspection methods presently employed are pictured on this page. Top left: Maintenance personnel evaluate a defect found during magnetic particle inspection. Top right: A radiograph of an engine made with iridium 192 is being examined. Bottom: Tubing is inspected with portable magnetic particle equipment

augment the proven magnetic partical and flourescopic inspection methods.

Since NDI methods are relatively new to the vocabulary of Army aviators, a brief review of these concepts is in order:

• *Radiography*, usually referred to as X-ray, is a method of non destructive inspection used to examine components and aircraft structures without disassembly. A radiograph is a shadow picture of an object placed between a source of radiation and X-ray film. Two different sources of radiation are used—X-rays and gamma rays. Both produce radiographs, but are produced and used in different ways. X-rays originate in an X-ray tube when electrons traveling at high speeds collide with matter. Gamma rays are emitted from the disintegrating nuclei of a radioactive material (isotope) about the size of a cold capsule. The radioactive material is sealed in a small, shielded container to prevent radioactive contamination of the object and area. Radiography is being used to inspect the structural integrity of numerous parts and will show internal cracks, corrosion and other defects without disassembly.

• *Eddy current* inspection is the process of inducing small circulating electrical currents into a conductive material using a coil to create a magnetic field. If the magnetic field around the test coil changes, the indication will change. Numerous types of eddy current inspection equipment are used in the aircraft industry.

Some of the advantages of eddy current inspection are: accurate measurement of conductivity; high speed inspections; immediate indications; detection of small discontinuity areas, as small as 0.00006 square inches; and portability.

The eddy current inspection method has disadvantages or limitations. These are: specific nature of the discontinuity is not clearly defined; depth of eddy current penetration is restricted to depths of less than ¼ inch in most cases; and testing of ferromagnetic metals is sometimes difficult.

Application of eddy current inspections are confined to tubing, cylinders, sheet metal extrusions and plating thickness on various objects and is considered one of the most reliable methods of inspecting rotary wing spars. Eddy current inspection methods are very adaptable to automatic production inspection.

• *Ultrasonics* is another form of non destructive inspection used to locate defects in metals. By transmitting sound waves into an object with a transducer, the return signal is read on a cathode-ray tube which displays the sound wave pattern as it passes through the object. In this way any distortions in the object undergoing inspection are seen as discontinuities on the cathode-ray tube. Ultrasonics are rapidly becoming one of the most practical methods of inspecting aircraft components. Several reasons for the success of ultrasonic inspection are the speed at which the inspection may be performed; the accuracy of inspection; the economy; the reliability; and portability.

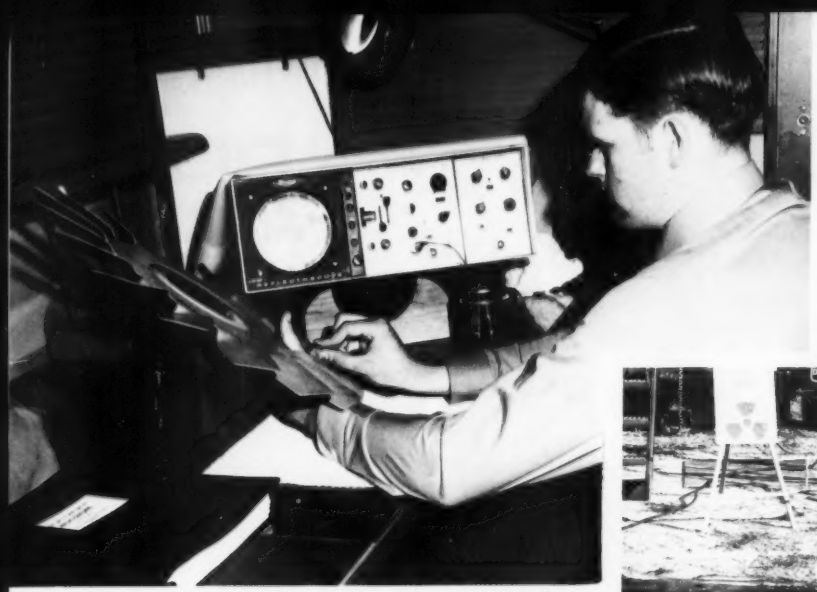
At Ft. Rucker the ultrasonic inspection technique is used on TH-13T tail rotor blade cuffs, OH/TH-13 cooling fans and UH-1 series tail rotor yokes.

• *Sound and vibration analysis* has become one of the most reliable methods of troubleshooting and inspecting rotary wing aircraft for vibrations. By pre-establishing the normal vibration frequencies of each component at operating rpm, harmonic variations from normal vibrations are detected using a sound and vibration analyzer. Most often the high frequency vibrations inherent in rotary wing aircraft cannot be isolated to any specific dynamic component by the human ear because the audible range for most people is very limited. Thus, an instrument with a very wide frequency range is needed to eliminate the guesswork in isolating the defective or vibrating component.

Maintenance and inspection requirements of Ft. Rucker aircraft represent one of the most difficult tasks in the aviation industry. Last year there was an average of 997 aircraft assigned. These aircraft flew 895,148 hours during the year for an average of 897.8 flying hours per aircraft.

Much time and effort is saved when components are inspected without disassembly. Here bearings are inspected with vibration analysis equipment

There are 14 different types of aircraft assigned to the Ft. Rucker fleet, each requiring maintenance and inspections tailored to the specific type aircraft. This results in about 183,546 scheduled inspections annually. Additionally, some 18,700 non destructive inspections were conducted on live aircraft and



Left: Ultrasonic inspection equipment often discovers discrepancies which would be missed using other techniques. Right: Portable radiograph equipment adds depth in versatility as well as improved accuracy of field inspection techniques

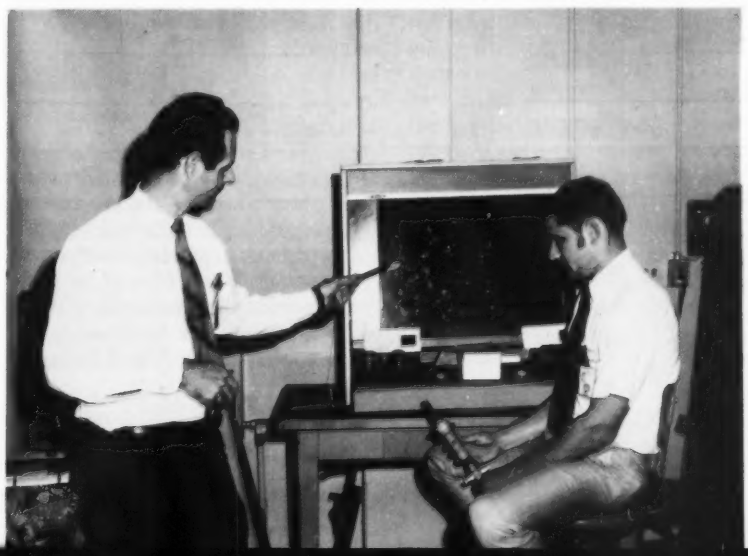
components during maintenance and overhaul of major components.

The ultimate benefits of the more sophisticated inspection methods and techniques is infinite and has just begun to be realized. Efforts to create more reliable inspection methods using iridium isotope radiography cameras have led to research in internal turbine engine inspections that can be accomplished without engine disassembly. The first exposures were taken at Ft. Rucker 12 November 1969 using a 100 curri iridium isotope. Preliminary findings have revealed a whole new approach which may be used to perform turbine engine inspections. This may lead to the capability of performing scheduled engine inspections in the field, determining the internal condition and sending engines in for overhaul only when needed—thus eliminating the wear and tear on the component by disassembly inspection and reassembly during scheduled inspections and overhaul periods.

In the same manner radiography equipment makes it possible to inspect aircraft structures hidden by upholstery and other obstacles without disassembling the aircraft. By placing film over the outside skin of the aircraft and using a 360-degree radiation emission X-ray tube, exposures of the structure are taken. Technicians can accurately detect cracks, loose or improperly installed fasteners, etc., by reading the radiographs much as a doctor examines the X-ray exposure of a patient.

Since these NDI concepts were implemented in 1968 there has been a significant reduction in aircraft downtime, with a proportional increase in availability. Improvements in reliability have resulted as NDI locates defective parts which ordinarily would have gone undetected. For example, last year ultrasonic inspection of the UH-1 tail rotor yokes resulted in the rejection of 402 yokes out of 4,874 yokes inspected. Without ultrasonics it would be difficult to estimate how many cracked tail rotor yokes would have gone back into service or how many could have resulted in accidents.

The importance of non destructive inspection concepts should be evident to all aviators as one of the most significant advancements in aircraft maintenance and aviation safety in recent years.



Efficiency is greatly increased by using microfilmed indexes of component parts and materials

GUNSLINGER

THE TROOP COMMANDER walked into his room, dropped his "chicken plate" in the corner, stored his flight gear and plopped down in his plastic Vietnamese lawn chair. Every fiber of his body ached from the long hours of being strapped into the command and control helicopter. It had been one of those rare days when combat activity had been slow, yet he felt as though a disaster was about to strike his unit. One thing of which he was sure was that disaster was about to strike two of his young lieutenants.

Why? Why did he feel this eerie feeling of double disaster? The two

...OR COMBAT LEADER?

A unit commander needs more than courage and aggressiveness to be a leader

Major Richard H. Marshall

lieutenants were the "last straw" as there were many underlying factors that had been building up during the 3 weeks since he had assumed command of the air cavalry troop. His ire had forced him to tell the lieutenants to report to his quarters in 45 minutes rather than immediately. This delay would allow him time to think out the problem.

Both of the young officers were flight section leaders. One had a scout section and the other a gun section. That day each had failed to comply with established policy, but each in separate incidents. One had tactically violated policy while the other had administratively struck down a subordinate.

The commander had observed the gun section leader leading his section low level the entire 40 miles from the area of operation to the base camp. It was unit policy that enroute low-level flight was prohibited unless the tactical situation dictated otherwise.

The scout platoon section leader had submitted an efficiency report on one of his subordinates that basically said, "George flies helicopters." And he had neglected to submit recommendations to the troop commander for two valor awards for members of his section who had heroically participated in a combat action 3 months earlier.

Both section leaders had outstanding individual combat records, so where was the problem? The commander answered his own question—*because they are gunslingers rather than combat leaders.*

What is a gunslinger? He is a young, dynamic bundle of unlimited potential that plans to conquer the world with sheer boldness. He has more courage than the average, loves beer, war stories, deviation from the prescribed military uniform, sun bathing, movies, parties, floor shows featuring an all girl cast, motorcycles, guns, chatting on the radio and, last but not least, hotrodding aircraft. His greatest pleasures in life, to mention a few, are flying low level, out-of-ground effect, and in and around the enemy. He enjoys shooting any kind of aerial weapon and loves to hear his own ordnance explode. He likes all his platoon members and lets them know by the first name basis that he has established. He hates paperwork, maintenance, getting up early, briefings, corrections, military publications, regulations and cleaning weapons.

In contrast, what is a combat leader? His likes are basically the same but he learns to blend them professionally. He flies his aircraft within prescribed limits and his own capabilities and ensures that this standard is complied with by all of his subordinates. He readily accepts his mission and then applies whatever procedures and techniques are required to accomplish that mission. He ensures that he does those things that he dislikes. After he acquires a knowledge in these subjects, he replaces his dislike for them with job satisfaction. He gets to know the capabilities, limitations and the problems of his people—rather than just their first names.

The commander's temper cools and he smiles to himself when he recalls that there were times not too many years ago he might have been classified as gunslinger.

How in the world do we become gunslingers, or for that matter combat leaders? A gunslinger is born out of the male ego and a desire for adventure. A combat leader is developed from knowledge, maturity and a desire for mission accomplishment. Both have an abundance of courage, determination and initiative, but one controls his actions while the other reacts from impulse. The combat leader perceives danger and calculates his every move. He thinks "teamwork" and acts accordingly. The gunslinger does not have the ability to perceive unsafe conditions and is inclined to become a one-man show. Often his last act in life is to mark his position with the smoke of his burning aircraft. One continues to learn and mature while the other plays.

A combat leader is a professional that applies his professionalism to all that he does in preparation for combat or during actual combat. A gunslinger is a statistic moving without direction. The combat leader accepts the additional responsibility of promotion while the gunslinger accepts only the prestige of promotion. The combat leader will recommend while the gunslinger criticizes. Actually they are both the same—one with guidance and the other without.

A knock at the door reminds the commander of a very important primary duty: guidance to the young leader. He tells the two officers to come in, leaves them at attention and asks, "What is a gunslinger?"

STOP SMOKING
Aeromedic
CONTROL YOUR DIET
Provided by the Society of U. S. Army Flight Surgeons
EXERCISE DAILY
Major Nicholas E. Barreca, M.D.
AVOID ALCOHOLIC
BEVERAGES AND DRUGS

To the air crew member: The objective of Army aviation medicine is to promote the *optimum* health, well-being, safety and fitness of all air crewmen. It is not merely to promote conditions that will decrease the likelihood of disease or infirmity, nor simply treat your daily ills. What will you do to help us achieve this end?

You should:

• *Stop smoking because you're killing yourself.* Oh, it may not be right away, just slowly. A little premature heart attack followed by a big premature death. Perhaps a pulmonary (respiratory) cripple at an early age . . . unable to stagger 10 steps without becoming incapacitatingly short of breath. Or maybe a little "mild" cancer of the lung. But don't worry, these probably won't interfere with your flying career . . . at least not right away.

• *Stop stuffing your face because you're complicating your future with disability, discomfort and drugs.* So maybe you smoke, too. Why not enjoy your heart attack? Make it a big one. Or perhaps you would prefer a little diabetes or high blood pressure . . . then you can count your pills and your days because they are numbered.

• *Stop laying around, you're guaranteeing future inactivity.* Why worry? You'll be well-practiced for those extended periods of incapacitation. People with histories of exercise and activity are thought to be less likely to suffer heart attacks. Further they are less likely to have serious complications even if they are destined to suffer one. But that's too far in the future to think about, right? Why should you begin an exercise program? It's so darn boring and time consuming. So what if it increases your performance, productivity and general vigorous enjoyment of life? So what if it increases your tolerance to some of the stresses in the aviation environment?

• *Stop bending your elbow.* You're going to send yourself spinning. Why worry though? You've always been able to handle a little booze. You're tolerant, right? Or have you just learned to control yourself better under the influence thereof? So the next day you feel a little sour, groggy or just plain blah. Why worry though? Your judgment and coordination is not critical in the Army's low and slow birds, right? So what if your internal gyro or balance organ is more sensitive to disorientation for as long as 36 to 48 hours after 3 to 4 ounces of alcohol? No Army air crewman would drink that much the night before a mission, would they?

Granted, some people are predisposed to some disease processes by inheritance of certain tendencies from their ancestors, but this can be minimized. It is better to develop disease and disability 10 years late than 10 years early. So, let's not hasten disease and disability along. Optimize your chances for a productive and enjoyable life and successful career in Army aviation.

STOP SMOKING.
CONTROL YOUR DIET.
EXERCISE DAILY.
AVOID ALCOHOLIC BEVERAGES AND DRUGS.

To the flight surgeon: The individual air crewman generally knows the consequences of these self-imposed stresses. However, it is easy to forget or ignore the less than immediate consequences. As

a flight surgeon, you must constantly ensure the continued motivation of each and every air crewman toward minimizing these stresses. By your leadership and *example,* weight control and exercise programs can be established. These programs cannot just be attended by lip service. They require active, dynamic and regular participation or observance. Your frequent counseling regarding the other stresses can take the shape of education during individual sick call visits as well as by carefully prepared and enthusiastically presented lectures on health and safety.

Are you doing your job?

Hook Up . . . Safely

Many aviators have an unfounded dislike of external loads. With more experience they soon discover the advantage of external over internal loads . . . if a few simple precautions are followed

CW2 Raymond A. Gruetzner

TO ACHIEVE the fulfillment of Army aviation's mission, the support of the ground troops, it is a necessity that every rotary wing rated Army aviator be capable of safely conducting external load operations. Every Army aviator graduating from the U. S. Army Aviation School at Ft. Rucker, Ala., receives training in external loads as a part of the tactical training syllabus. For many this is a first and last encounter with external loads. For others, particularly those assigned to the Republic of Vietnam, this training may prove to be invaluable.

My year in Vietnam was spent with the 48th Aviation Company (Assault Helicopter) which is located on the coast of the II Corps area between Tuy Hoa and Nha Trang. External load operations played an important role in the performance of the company's mission which was direct aviation support for the 9th Republic of Korea Division. Approximately 95 percent of our forward area and rear area resupply for the Koreans was accomplished by utilizing external loads.

Many Army aviators have an unfounded dislike for external loads. This negative attitude is more than likely due to the limited exposure to them during flight school. As in any situation though, experience formulates an enlightened point of view and the advantages of external loads, as opposed to internal loads, soon exceed the disadvantages.

A ground commander can more efficiently use a helicopter and its crew assigned to him for resupply by utilizing external loads. Loads that have been assembled and rigged before the aircraft arrives reduce time consumed on the ground during the loading and unloading process.

With regards to safety, external loads again have the advantage over internal loads. In event of an engine failure, it is much easier to jettison an external load. During forward area resupply, using external loads reduces exposure to enemy fire. This is particularly true in the absence of a prepared landing zone which means that considerable time must be spent unloading an internal cargo from a hover. Hovering over double or triple canopy jungle for an extended period of time is indeed a precarious situation which none of us relish.

When working with external loads there are certain additional safety precautions to be taken. Safety begins with the pilot's initial preflight of the day and, when use of the cargo hook is anticipated, this too should be thoroughly checked.

Begin the cargo hook preflight with a check of all visible parts for general appearance and condition. Ensure that the nylon ring and bumper directly above the hook assembly itself are installed. Also ensure that the three restraining springs are installed between the cargo suspension shaft and the airframe. These springs should allow the entire cargo suspension system to move fore and aft and laterally but prevent it from twisting or rotating.

Check operation of the hook with one man under the aircraft and one man in the cockpit. Turn the battery switch on and place the cargo release switch in the "ARM" position. Apply downward pressure on the lip of the cargo hook while the man in the cockpit checks both electrical releases and the manual release. Next, give the hook assembly lip a sharp blow with a clenched fist. The cargo hook should not open. Return the cargo release switch to the "OFF" position and turn the battery switch off. Again give the hook assembly lip a sharp blow to ensure that it will not open. If any part of the cargo suspension system is missing or does not operate properly, do not use the aircraft for external loads and make the proper writeup concerning the fault on DA Form 2408-13.

The preflight of the cargo hook does not constitute the end of the check. At the hookup area, before picking up a load visually check that the approved flexible loop is attached to the cargo sling as you hover toward the load. After the load is hooked and a hover check

Chinook lifting 105 mm howitzer with its basic load of ammunition to new site

has been performed with the load 3 feet above the ground, place the cargo release switch in the "OFF" position and depress the electrical cargo release button (pilot's and copilot's). The cargo release switch is then returned to the "ARM" position. If the hook malfunctions and the load is released when moving the cargo release switch from "ARM" to "OFF" and back to "ARM", or when the electrical cargo release buttons are depressed with the cargo release switch in the "OFF" position, the aircraft cannot be used for external loads and again the fault should be entered on the 2408-13. This procedure is to ensure that there is no stray voltage which will accidentally release a load while switching from "ARM" to "OFF" and back to "ARM" and also that a load cannot be accidentally released while the cargo release switch is in the "OFF" position.

Upon completing the above check, execute a normal takeoff with the cargo release switch in the "ARM" position. An air speed of 60 to 70 knots will give the smoothest and safest flight, but it may be necessary to adjust the air speed to each particular load due to differences in size, shape or weight distribution to keep oscillation and swinging of the load to a minimum. Always employ flight paths that will keep you clear of as many of the populated areas as possible—an "unplanned release" may still occur.

Vietnam may introduce another problem to external load operations. More often than not you will not have trained personnel at the hookup point. Many times there is one man to hook up the load and no ground guide for the pilots. This was the case in our support of the Koreans. A situation like this makes it necessary for the crew chief to watch the load and give directions over the intercom system. When operating in this fashion, it is your duty to take extra precautions to ensure the crew chief's safety.

Often times the crew chief will assume a sitting position on the left skid to watch the load during hookup. This is definitely a dangerous position should abrupt control movements or an engine failure occur. An equally unsafe position for the crew chief is bending at the waist and leaning head first out of the well. The only safe position for the crew chief to assume is lying face down on the cabin floor and looking out the left cargo door at the load. Also, he must always use the approved safety harness, or "monkey strap" as it is commonly called.

You ask yourself, Why should I know this? It's the crew chief's job, isn't it? Yes, it most certainly is his duty. You will undoubtedly encounter as I did experienced crew chiefs who have picked up bad habits and practice them or an inexperienced one who has never had to direct a load from inside the aircraft. In addition to flying the aircraft, it is your duty as aircraft commander to see that your crew is properly equipped and briefed to perform their duties in the safest manner possible.

THE MAST PROGRAM

Specialist 5 Tom Bach

The 507th Medical Company (Air Amb) at Ft. Sam Houston, Tex., has demonstrated that helicopters can reduce civilian accident fatalities by providing swift aerial evacuation to hospitals

THE UH-1H HUEY made its first sweep of the area, its crew peering anxiously into the blackness for a marker. Suddenly a flare was ignited, then another, then two more and the pilot saw for the first time the denseness of the landing area.

Trees lined both sides of the narrow roadway. The road itself sloped at a dangerous angle. The aircraft commander looked at the pilot, but no words passed between them. Both were experienced medevac pilots and knew it would be difficult to land.

Instinctively, there was no hesitation. A life was at stake. They hovered the helicopter briefly at treetop level, then slowly, carefully descended. The huge red cross on the UH-1 was reflected in the light of the flares.

Touchdown.

The cargo doors slid open and the crew chief and medic leaped from the aircraft, a litter held between them. They rushed the few dozen yards to the man lying in the road, writhing in pain, making a silent plea for help through the agony etched in his face.

The crew chief nodded to the men on the scene and began to help the medic. The two silently, quickly and efficiently prepared the man for litter travel.

Within minutes the injured man was returned to the ship, quickly secured and the doors closed. The Huey rose slowly from its precarious perch, then swiftly disappeared into the darkness.

A Dustoff operation in the wilds of the Republic of Vietnam? No. This was a MAST unit at work on a lonely backwoods road not far from metropolitan San Antonio, Tex.

MAST, or Military Assistance to Safety and Traffic, is a unique new program instituted jointly by the U. S. Department of Defense and Department of Transportation to aid civilian authorities in their efforts to save lives by providing swift evacuation to hospitals for anyone seriously injured in traffic or other mishaps.

The experimental and evaluation phase of the new 6-month test program is being conducted at Ft. Sam Houston, Tex., by the 26 officers and 132 enlisted men of the 507th Medical Company (Air Ambulance).

Prior to receiving the MAST mission, the 507th had been primarily a training unit. Pilots and crews, all Vietnam returnees, were assigned to the unit to conduct training and maintain a constant state of readiness. The MAST operation put that skill, training and readiness to good use.

Captain Samuel B. McLamb, who was aircraft commander on the first MAST mission flown on 17 July, observed that it was the closest thing to a Vietnam Dustoff mission one could imagine. It included the same tension and speed . . . everything but the hostile fire.

Since that first mercy mission, the crews of the 507th have participated in many missions such as hospital-to-hospital transfer of a 3-day-old infant who needed a complete immediate blood transfusion and the rescue of a telephone repairman electrocuted while working on a cable in the hilly areas surrounding San Antonio.

In each case the 507th crew was airborne in less than 2 minutes after being alerted. "When that emergency phone rings," says Captain Tom Ely, MAST project officer, "we're gone. We ask questions later. Two Huey helicopters are ready to go at all times, with a third available for backup."

Perhaps the most severe test came on Friday, 7 August. A request for medical evacuation was received from a hospital in Uvalde, Tex., and within minutes a second

emergency call came from a Crystal City, Tex., hospital.

One helicopter and crew flew to Uvalde Memorial Hospital to transport a victim with a crushed chest to Bexar County Hospital in San Antonio. It stopped off first at Bexar County Hospital to pick up a respirator necessary to keep the patient alive during the flight.

The second chopper took off moments later for Wintergarden Hospital in Crystal City, stopping at the Santa Rosa Medical Center in the Alamo city to pick up a nurse and incubator needed for the infant to be transported.

While the two missions were being flown, new crews were alerted and additional aircraft were made ready in event of another emergency. In addition to the usual field equipment assigned to most types of units, the 507th has a radio beacon system; an operations van to control air traffic on the field; a maintenance van to supply tools and equipment for maintenance of the aircraft; a 5-ton wrecker; and its helicopters.

The MAST experiment in Texas is centered in a 10-county area surrounding San Antonio. In extreme emergencies counties adjacent to the area covered in the test program are included, provided they are within range of the helicopters.

Seventeen hospitals are included in the test area. The 507th's aviators have become familiar with the landing situations at all of them through constant practice flights, under all types of flying conditions, both day and night.

The MAST program can be traced to 28 April 1970 when civilian leaders from the Ft. Sam Houston area met with an interagency study group from Washington, D. C., that included representatives of the Department of Transportation; Department of Health, Education and Welfare; and the Department of Defense. This resulted in a proposed plan for the implementation of the MAST program being submitted by the Alamo Area Council of Governments at San Antonio.

On 15 July 1970 Secretary of Defense Melvin R. Laird and Secretary of Transportation John A. Volpe jointly announced the test program to determine the value of helicopters in providing medical assistance to auto accident victims and other persons needing emergency medical care.

Since the initiation of the program, several of the hospitals in the area have constructed either temporary or permanent helipads. Local law enforcement officials have been briefed on the project and given instructions on how to contact MAST in case of an emergency. It is up to the officials on the scene to determine if MAST should be called in. They have to make the judgment whether or not the situation is critical enough to call for the helicopter or if conventional land ambulances can do the job.

The 507th is not in competition with the ambulance services, but situations arise when a helicopter can get an injured person to a hospital quicker than a ground vehicle and this could mean the difference between life and death.

The MAST program has drawn praise from Secretary of Defense Laird, Texas Governor Preston Smith and numerous government officials in the test area and throughout the United States.

Many physicians, medical administrators and government representatives are watching the results of the program carefully with an eye to expansion. Some have voiced the opinion that MAST is perhaps the most significant civilian-military cooperative effort to take place in many years.

Of course the program does have its critics, but these people find it difficult to convince people like Dr. John Williamson that the program is not worthwhile. Dr. Williamson is the physician who attended the first MAST patient who was brought to Baptist Memorial Hospital in San Antonio. The patient was a boy whose chest had been crushed when he was run over by a truck. "The swift evacuation of the boy by helicopter definitely saved his life. The program is tremendous!" Dr. Williamson proclaims.

At the accident scene, following a request for assistance, members of the 507th Medical Company administer medical assistance before moving patient. (This photo was posed)

Crewmen deliver 3-day-old Martha De La Rosa in an incubator to the Santa Rosa Hospital. She was picked up at Crystal City, Tex., and delivered to the hospital's helipad

Lieutenant Colonel Alfred H. Kirchner

Ice roulette may very well be even more deadly than Russian roulette, but don't try it to find out

ALTHOUGH the title of this article may not resemble the famous game Russian roulette, it certainly can be as dangerous, and I'm sure it has killed more qualified aviators than that suicidal game. Looking back, I can recall a few of the unfortunate and sometimes humorous encounters I have had with icing conditions as an aviator. I am now amazed that I ever let myself be put in some of these situations. However, lack of experience, weather data and a desire to accomplish the mission sometimes overcomes common sense, school training and weather briefings.

My first encounter with extreme icing conditions occurred while flying a CH-34C in Greenland in the summer of 1960. While on a routine mission carrying passengers and cargo from Camp Tudo, Greenland, to Camp Century, approximately 120 miles toward the center of the icecap, we encountered a fog condition. We were able to barely maintain visual reference with the icecap, and though we had more than enough fuel to perform a 180-degree turn and abort the mission, we were unwilling to admit defeat and plowed on.

The first indication that the aircraft was picking up ice was an increase in manifold pressure to maintain altitude and air speed. From the time we noted this increase to the time that altitude and air speed could not be maintained

was a matter of minutes.

An approach to the icecap was started and a successful landing accomplished. However, it was necessary to tax all available manifold pressure to land. Upon disengaging the rotor system, it was discovered that the leading edges of the main rotor blades and tail rotor blades had approximately 4 inches of ice protruding and a thin layer of ice covered the entire aircraft.

There is no doubt that had this increase in manifold pressure not been noticed until a few minutes later, a successful termination of the landing approach would have been impossible and a disaster could have occurred. A similar incident occurred a few days later to one of my fellow pilots, performing almost the identical mission. He also performed an approach to the icecap; however, on touchdown the ice on the leading edge of one tail rotor blade separated and set up such a tremendous vibration that it caused minor structural damage to the tail rotor system. Had this happened in flight or on short final, I am certain the results would have been tragic. Neither of us flew into a foggy or hazy condition on the icecap again.

The second experience I had with ice occurred approximately 18 months later at Davison Army Airfield, Va. We had been assigned the mission in late February to fly two field-grade officers to Ft. Monroe and to return to Davison Army Airfield. The aircraft assigned to accomplish this mission was a U-9 (L-26)—more popularly known as an Aero Commander. The aircraft commander was an instrument examiner and at the time I, as copilot, had a standard ticket. Our weather briefing indicated that there was a 700-foot overcast at Davison and the weather would extend as far south as Richmond. Pilot reports had indicated light icing above 1,000 feet. Performing this mission would require flying into a known icing condition. However, we were convinced our aircraft had this capability and we proceeded fat, dumb and happy to file an IFR flight plan. After takeoff, we were cleared direct to Brook omni.

When passing through 2,000 feet the cockpit of our aircraft filled with smoke. An emergency was declared and we were vectored direct from our position to intercept final approach course of the Davison GCA. All unnecessary electrical switches were shut off immediately. Upon intercepting final approach, we noted most of the smoke had cleared the cockpit and we assumed that one of the switches we had shut down had temporarily rectified the situation. By this time, the temperature inside the cockpit had dropped well below freezing. On short final with gear down and carburetor heat in the green, visual reference with the ground could not be made at 500 feet indicated.

When I glanced out the side window, I realized that we were VFR but the windshield was covered with approximately 1/2 inch of ice. Because of the approach speed and lack of forward visibility, a go-around was commenced and we received permission to remain VFR at 600 feet in an effort to dissipate the ice so a successful visual landing could be accomplished.

At approximately 600 feet altitude, 140 miles an hour air speed and in a left turn, the left engine vibrated violently and lost approximately 1500 rpm, placing the aircraft in an almost inverted position. A recovery was made and it was discovered that the aircraft had accumulated such an abundance of ice that altitude could not be maintained, even though the right engine was increased to full power. Pointing the aircraft in the direction of a clearing and at an altitude of approximately 100 feet, the left engine backfired and regained rpm. Power was increased and a pullup initiated, but due to the weight of the aircraft contact was made with one of the taller trees, damaging one of the horizontal stabilizers.

After 500 feet had been obtained and we had made several passes over the field, it was evident we could not dissipate the ice due to the extreme cold. This time an attempt was made to restart the heater. After several unsuccessful attempts, we tried to scrape a hole in the ice on the windshield large enough to regain forward visibility. With great difficulty, not to mention personal pain, it was discovered that this could be accomplished with a small pocket knife. After several more passes over the field, we had managed to scrape an area large enough so a successful visual approach could be accomplished. After landing, we discovered that the air intake for the heater had completely iced over, thus starving the heater, causing it to flame out and fill the aircraft with smoke.

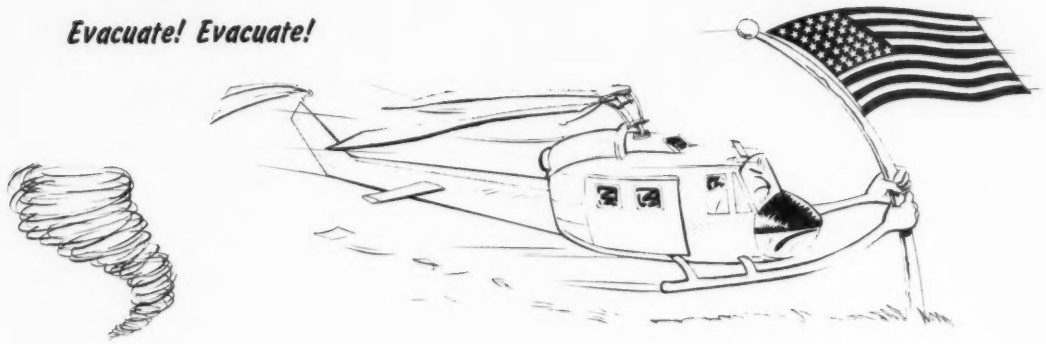
The only explanation that could be given for the loss of power on the left engine is that ice had accumulated around the carburetor intake, and when power was increased for the go-around this ice broke off and went into the carburetor, causing a temporary loss of power which was nearly disastrous.

I feel certain had we known our aircraft better, paid attention to the weather briefing and used a little common sense, this near disaster and many gray hairs could have been prevented. I feel very fortunate that I am able to relate this experience and only hope that it prevents someone else from getting gray hair.

Don't play ice roulette. Know your aircraft; know your capability; listen to the weather briefing; and use your head. I think these four rules are worth a thousand crosschecks.

Maintenance

Evacuate! Evacuate!



CORRECTION

Safetywiring: The September issue made reference to TM 55-405-3 in its tip on safetywiring. This manual has been recently superseded by TM 55-1500-204-25/1, General Aircraft Maintenance Manual, dated April 1970. Our thanks to those alert individuals who notified us of this change.

Keep Those Lights Working: When making a check of the caution lights on the center pedestal of your UH-1 and one fails to illuminate, press down on either side of the segment and it should rotate 180 degrees to expose the bulb. Check the bulb for corrosion build-up. Clean it up, reset it and re-check it. If the light still fails to come on, replace it with a spare bulb. If you don't have a spare, remove an illumination bulb from one of the other controls panels on the center pedestal. Don't forget to make an entry on DA Form 2408-13 that you removed a bulb.

Keep It Clean: If you're in the Republic of Vietnam, especially dusty areas, during the daily inspection of your aircraft (while your particle separator and FOD screen assemblies are removed), take a clean cloth and wipe around inside the inlet section of the T53 (T55 if applicable) engine to include struts and guide vanes. A little extra "house cleaning" might mean that extra lift you need sometime. A dirty engine inlet section is one of the greatest single causes of low power and high EGT.

Just A Warning: (1) Prolonged skin contact with synthetic oils (such as MIL-L-7808 and MIL-L-23699) may cause a skin rash. Skin should be thoroughly washed after contact and saturated clothing should be removed immediately. Areas where synthetic oils are used should have adequate ventilation to keep mist and fumes to a minimum. Also, if these synthetic oils are spilled on painted surfaces, the surface should be wiped clean to avoid possible softening, blistering or peeling of paint.

(2) Structural damage can occur from turbulent surface conditions. Helicopters should be anchored or moored if wind is expected to exceed 45 knots. If at all possible, the helicopter should be evacuated to a safe weather area if a tornado, cyclone, hurricane or wind condition above 75 knots is expected.

(3) Do not interchange filler caps between 42-degree and 90-degree gearboxes on any UH-1 helicopters. If filler caps are inter-

Matters...

changed, the 42-degree gearbox will be pumped dry because the 90-degree gearbox filler cap is vented. The 42-degree gearbox filler cap is not vented. To aid in the elimination of confusion, the cases of the 42-degree gearboxes are marked with a black dot on the case and a black dot on the filler cap. The 90-degree gearboxes and filler caps have corresponding white dot markings.

Refueling Aircraft: When refueling aircraft be sure to ground aircraft, hose and nozzle assembly and refueling truck or station to each other. Be sure to wipe dirt from nozzle before fueling tanks.

Know Your Bolts: Most aircraft structural bolts are general purpose hexagon head type, internal wrenching and close tolerance. Aircraft manufacturers are sometimes compelled to make bolts of different dimensions or higher strength than the standard types. Since these bolts are made for a particular application, it is extremely important that like bolts be used for replacement. When such bolts are not available and it is necessary to fabricate them locally, care should be taken to use identical material and heat treatment specified in the applicable drawings or an authorized substitute material properly heat treated. These special bolts are identified by the letter "S" stamped on the head.

Grip length: As a general rule, bolt grip length should be equal to material thickness. The threads should neither bear on the material nor should the shank protrude too far through the nut. Certain variations are allowed since this is not always possible. Bolts of slightly greater grip length than required may be used provided washers are placed under the nut or bolt head. Aluminum alloy washers should be used, except in cases of high torque values or with steel bolts, to prevent corrosion. Steel washers should be used with steel bolts on steel parts. Note: Steel bolts and aluminum washers should be installed while still wet with zinc chromate primer.

Locking or safetying: All bolts should be suitably locked or safetied in accordance with the method used in the original fabrication of the aircraft. Approved methods of safetying are specified in TM 55-1500-204-25/1.

Torque values: Specific torque values for all bolts have not been established. Friction of the bolt in the hole and friction of the bolt head against the work are two variable factors which prevent formation of such values. In cases where bolts must be tightened to a torque (blind application), use experience and good judgment to avoid overtightening and overstressing the bolt. Refer to TM 55-1500-204-25/1 for specific bolt torque values.

Rigging The Hook: When checking or rigging the engine controls on the CH-47, be sure to have the helicopter's generators in operation. Do not check or adjust the control system using battery power or an external D.C. APU. Reason: The amount of voltage affects the speed and travel of the electromechanical actuators in the system. The D.C. voltage output from the aircraft generator system, through the transformer-rectifiers, is a constant 28 volts D.C. and is the source of power in normal operation. Battery voltage is too low and that of external power units may be too low or too high.

CH-47 Chinook: When installing the stick boost actuators on the CH-47, attention should be given to tightening of lever pivot bolts. TM 55-1520-209-35 states, "Lever pivot bolts *must* be free to rotate. They *must* have a *minimum* of 0.005 inch end play with nut MS17825-4 tightened to standard torque." If the pivot bolt torque is exceeded the pivot arm is not free to make inputs into the stick boost actuator. Since control of the Chinook is dependent on the flight controls, it would be a wise idea to check this item before takeoff.

Allowing the crew chief to maintain an aircraft's electrical system may be a simple solution, but when a qualified electrician is available, use him

The Aircraft Electrical Repairman

Lieutenant George L. Woolsey

THE GUNSHIPS followed the medevac helicopter unusually close; there was no moon and the lights on all three ships were purposely left off. It would be a small landing zone (LZ), and a hot one, but it contained three critically wounded men who needed to be evacuated.

Nearing the LZ the gunships laid down a blanket of rockets where enemy fire had last been reported. As the medevac pilot began to flare his ship to bring it to a halt over the LZ, he decided the area was too small for landing. Consequently, he maintained a 100-foot hover just above the trees as his crew chief attempted to lower the harness of the rescue hoist. But, for some unknown reason the hoist would not move. Fortunately another medevac was available and the wounded men were extracted, but this bit of fortune cannot always be depended upon.

The crew chief of the first ship and the maintenance supervisor will forever carry the responsibility for this unnecessary incident; they did not realize who should have been inspecting and working on the equipment.

This is one incident in a million where electrical systems and equipment were inspected and maintained by other than electrical repairmen. The extensive training and capabilities of these men are all too often overlooked because someone did not bother to study the varied jobs for which the electrician is responsible.

Electrical repairmen are being trained daily at the Electrical Section of the Aviation Maintenance Training Department, Ft. Eustis, Va. The instructors are probably the best in the entire Army and the instruction is of the highest standards.

An individual student normally enlists or reenlists to get to attend the 68F20 course of instruction [Aircraft Electrician]. The eligibility criteria are: 12 months service remaining after graduation, a score of 100 or better on the mechanical aptitude tests and normal color perception. The education level ranges from eighth grade to a college degree.

On a given day there are seven classes in session and from 18 to 24 students in each class. The urgently needed electrical repairmen are graduated every 2 weeks after 14 weeks of instruction. In fact, your next electrical repairman may be in the commencing class at this very minute.

A clash of symbols and the big, booming bass drum comprise the penetrating sounds of the march-

Students working on transformer rectifier

ing band. The respective class liaison officer (normally a rated maintenance warrant officer) gives this first class. It is an endeavor to motivate and stimulate the students by giving them an orientation to the mission of Army aviation and the future roles they will play in it.

During the next 2 weeks the student is taught to be a basic mechanic with extensive classes on all the forms and records used in his future trade. He also is given a general understanding of the jobs of several other members on the maintenance team.

The remainder of the course is divided into four major phases: fundamentals, component repair, alternating current and trouble-shooting.

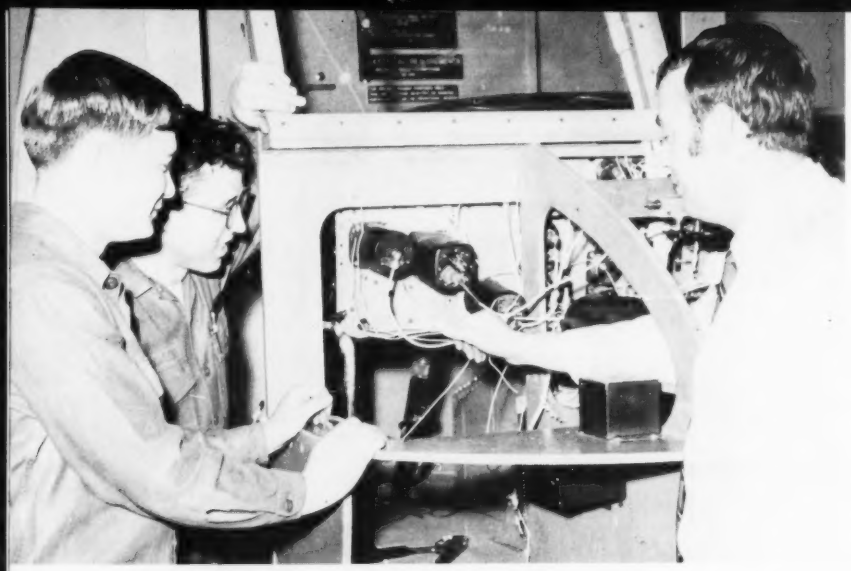
Often students are alarmed to learn that much of the course is theory of electricity. The first phase is the basic theories and principles used throughout the course. It is felt that a repairman should have well-rounded training and a thorough understanding of electricity. General principles of the operation of switches, relays, fuses and circuit breakers are presented. This commences his training in reading wiring diagrams and recognizing the functions of each symbol in a diagram.

The next class is pure theory; the electron theory is taught throughout the course. Here the student is confronted with direct current. Simultaneously, an excellent and thorough presentation of Ohm's law is given. Last in this series of basics is a simple circuit construction. The student studies a very simple form of generating electricity with a magnet and later learns that this was actually a direct current (DC) generator.

To properly understand such terms as resistance, amperage, voltage and so on, the student must see them in actual operation. Extensive practical work is done with the multimeter, ohmmeter and ammeter. The student not only learns the use of his measuring instruments but also reinforces his understanding of many technical terms. This is probably the most essential unit of instruction in the course. Expanding on his use of different meters, a presentation of series and parallel circuits is given. This reinforces his understanding, particularly of Ohm's law and wiring diagrams.

Component repair opens with basic repair such as soldering cannon plugs, replacing terminals, tying bundles and even repairing wire bundles with bullet damage. Principles of operation of DC motors is taught with concurrent training in testing and overhauling under close supervision. DC actuators lend themselves easily, after motors, to testing and overhauling. The student is presented with for-

Student utilizing multimeters



Students working on UH-1D trainer

mulas for computing power and also typical DC ratings. He rounds out his understanding of the DC systems with practical work and some conference instruction on starter systems, generators, batteries and voltage regulators. This includes testing and overhaul. Although the battery is not emphasized above the other components, an excellent presentation on setting up battery shops is given. The student, while able to advance freely, is provided with expert and close supervision.

The alternating current (AC) phase is a tremendous challenge to many students and a dark alley to a few. Only the best pass this portion.

Why AC? AC is becoming the more favored electrical system installed in modern aircraft. While it is more difficult to understand, it requires less maintenance. It also produces more power per unit of weight and it coincides with requirements of communications equipment.

This phase is almost entirely theory. Production of AC, a comparison of AC and DC and measuring AC in circuits are all presented. The AC phase continues to build his basic knowledge of AC. The student is presented with three-phase AC, operation of transformers and operation and testing of rectifiers, filters, vacuum tubes and transistors. It is, undoubtedly, a very demanding phase but a vital one.

How many of us have cursed the fuel quantity gauge for the deliberate lying it did? The troubleshooting phase commences with a block of instruction on troubleshooting the capacitance type fuel system. The use of testing equipment and method of calibrating and replacing the system are explained.

Operation and maintenance of the different ignition systems (magnetos and turbine engine ignitions) are presented. Also included is extensive use of the ignition analyzer.

AC power systems are thoroughly covered with emphasis on the CH-47 helicopter. This is followed by a block covering miscellaneous systems such as the wiring system of a turbine propeller, wiring of the rescue hoist and lighting, heating, deicing, warning and armament systems.

The final 4 weeks is similar to on-the-job training. Emphasis is placed on troubleshooting procedures. This includes maximum use of such aircraft as the UH-1, CH-47, AH-1G, OH-6, O-1 and the U-6. Several systems boards are used to simplify many of the systems before going on to the aircraft. While there is close supervision, student initiative is remarkable. Many classes have advanced beyond the scope of the program; one class rebuilt and completely rewired a U-6 and another did considerable work in repairing a crash-damaged CH-47 and an OV-1 prop feathering system. Instructors evaluate students on their abilities to discharge their duties or assigned jobs during this phase.

Throughout the course, of which 70 percent is practical application, emphasis is placed on the use of technical manuals, troubleshooting and repair rather than remove and replace.

The better students from the graduating class are retained to attend the 68F30 Instrument Repair Course. At graduation each student's remark is the same: "I want to ride in a helicopter!"

As members of this elite team of aviation we can take great pride in our electricians. And, although at times it may seem simpler to have the crew chief maintain the electrical system, the electrician has been trained to perform these duties. He has demonstrated his abilities and knowledge—now let's use him.

Student overhauling aircraft starter

About Face!

READ . . .

POTPOURRI

Change 1 to FM 1-40, dated *15 July 1970,* has been published by DA and should be in the hands of using units. It partially supersedes FM 1-110. Next change to FM 1-100 (CDCAVNA) will complete supersession of 1-110.

Got any gripes, complaints or other comments about aviation-type training literature? If so, write them down on DA Form 2028 and send direct to Commandant, USAAVNS, ATTN: ATSAV-DL-L, Ft. Rucker, Ala. 36360. The Office of Doctrine Development, Literature and Plans, USAAVNS, is the responsible agency for updating FMs, TMs, ATTs, ATPs and ASubjScd's at USAAVNS. Comments welcome.

Army aviators, FM 1-105, Army Aviation Techniques and Procedures, is printed in pocket-size format. Remove the applicable portions for the job you are doing and carry them in your flight suit. Change 1 is in print now. Change 2 is due soon.

On 23 October 1970 Major Patrick H. Brady became the first Army aviator to receive the Valor Medal originated in 1953 by the American Legion Aviators' Post No. 743, New York City. Major Brady was awarded the Medal of Honor last year for his daring and skilled evacuation of wounded men in the Republic of Vietnam.

The Valor Medal previously had been awarded only to rated Air Force members participating in a "conspicuous act of valor or courage performed during an aerial flight." A recent change in the by-laws of Aviators' Post No. 743 authorizes the presentation of three Valor Medals—to include rated members of the Army, Navy and Air Force. Permission to wear the Valor Ribbon was first granted in 1953 by the Chief of Staff, U. S. Air Force. Paper work is being processed by the Army and Navy to permit its selected member to receive the medal on the same basis as the Air Force. It is the only civilian award accorded this honor.

General Andrew J. Goodpaster, Supreme Allied Commander, Europe, recently presented the 357th Aviation Detachment with a special award for its unblemished flying safety record.

A TASCOM unit assigned to the NATO/SHAPE Support Group (US), the 357th received the award at Chievres Air Base, Belgium, for having achieved the best Category Four accident- and incident-free record in USAREUR this year.

The organization has received a flying safety certificate every year since its inception in 1966. But this year's presentation took on special significance inasmuch as the unit has amassed more accident-free flying time than any other USAREUR-based detachment in the Category Four class. The 357th has logged over 618 hours in the air this year.

Flash! The October Instrument Corner question concerning filing IFR to a no procedure turn (no PT) fix, although correct at the time of printing, has been changed by Section II of the DOD FLIP dated 15 October 1970. You may file to a no PT fix if, and only if, it is depicted as an initial approach fix (IAF) on the appropriate approach plate.

Instrument Corner

Q. Why do the FLIP low altitude enroute charts depict only some compass locator beacons and not all?

A. IACC No. 1, Specifications for FLIP Enroute Low Altitude Charts —US, indicates that compass locator beacons shall be shown on the enroute chart only when used either as an aid to airway navagation or for local control in terminal areas where area charts are not available. This also is true for localizer courses, so when planning a flight utilize the IFR Supplement in addition to the enroute charts to obtain radio aids to navigation.

PIPELINE

"ROGER THAT"

WOW! THOSE who replied to the DIGEST's Pipeline survey published in August certainly were not afraid to express themselves. One or two of the comments were . . . well, ahem . . . let's say shocking. But almost all of the comments we received were constructive and solidly endorsed the magazine.

In analyzing the replies we found we had a bonanza of ideas, comments and suggestions on our hands. We learned that everyone wanted us to expand our coverage in the particular area in which he was interested. For instance, maintenance types requested more on maintenance, fixed wing pilots wanted more on fixed wing, air traffic controllers asked for more on air traffic control, etc.

We'd like to comply with each of these requests. But the DIGEST has only so much space and since it is the Army's only aviation safety magazine it cannot be limited to one area. It must include coverage of all operational aspects of Army aviation as dictated by its mission, which is printed on the inside front cover of each issue. The majority of readers, however, were pleased with the variety of subject areas now covered. In fact, over 98 percent of the hundreds of replies received stated that the DIGEST was always helpful and interesting. Only 18 persons did not like the magazine.

Naturally in a magazine covering as many areas as the DIGEST there are bound to be some disgruntled readers. Several criticized the lack of specifics in accident reports, but publishing aircraft tail numbers, locations and names is forbidden by AR 385-40, paragraph 1-4. A lieutenant colonel said the magazine should be written more plainly, while a captain stated it was written too simply (what're you gonna do?). Then there was the chief warrant officer who desires Pearl *au naturel'*. And to the captain who has never had an accident and writes that we go overboard on safety, we can only sincerely hope that he continues to get more than his share of luck.

Probably the most heavily marked area of the questionnaire was the reader evaluation of our regular features such as Charlie and Danny, USAASO Sez and Maintenance Matters. We felt we had a good thing in our features and your replies proved it. However, for those who bemoaned the loss of Frozzleforth and Pearl please note "Son of Frozzleforth" who appeared in the October 1970 issue, and there may yet appear "Cousin of Frozzleforth," an ace mechanic. As for Pearl, plans are indefinite at the moment.

Many readers stated that they have trouble getting the DIGEST. This seems to be a continuing problem which has been mentioned in every previous survey. One aviator (a conscientious young aviation safety officer) said that his unit had 43 aviators but received only one copy of the DIGEST. Another mentioned that the only copies of the DIGEST seen by some 40 aviators in his advanced course were two or three copies in the school library. And many wanted to know how to go about getting the DIGEST. These questions are answered on the facing page.

The DIGEST is distributed to active duty units under the pinpoint distribution system; that is, it is sent directly from the printer to those which have requested it on DA Form 12-4. These units are entitled to as many copies as they need.

Now here's a look at what's in the mill:

- For those of you who wanted more on IFR, we have initiated a regular but modest quiz to be included in the "Potpourri" feature each month with the able assistance of the Evaluation Division, Director of Instruction, USAAVNS, Ft. Rucker, Ala.
- More regular info on new and revised FMs, TMs and regulations each month courtesy of the Office, Doctrine, Development, Literature and Plans, USAAVNS.
- Several ATC articles along with coverage of IFR problems.

Your enthusiastic response to the survey was most appreciated. There were many real morale boosters to be found in your replies. But please, please don't wait until the next survey to make comments. Any time you feel you have something to say, drop us a line.

HOW TO GET THE DIGEST

THE U. S. ARMY AVIATION DIGEST is an official Department of the Army monthly publication for those having an interest in Army aviation. Official distribution of the magazine is handled by The Adjutant General.

Active Army requests for both initial issue and revisions to an account are submitted on DA Form 12-4, "Requirements for Department of the Army Administrative Publications Other Than Regulations and Circulars." The completed 12-4 is submitted to the

Commanding Officer
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2800 Eastern Boulevard
Baltimore, Maryland 21220

Detailed instructions for preparing the form and other pertinent information is provided on the back of the DA Form 12-4.

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Building 157, Third Floor
Washington Navy Yard
Washington, D. C. 20390

Coast Guard units submit requests to

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Editor
U. S. ARMY AVIATION DIGEST
Fort Rucker, Alabama 36360

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Superintendent of Documents
Government Printing Office
Washington, D. C. 20402

Charlie and Danny's Write-In

DEAR DANNY: TM 55-1520-225-10, Ch/1, page 4-6, figure 4-3 shows the power off autorotative glide for the OH-13S as 40 mph. I have been taught that 60 mph is the best glide air speed. Why doesn't the manual get realistic for once?

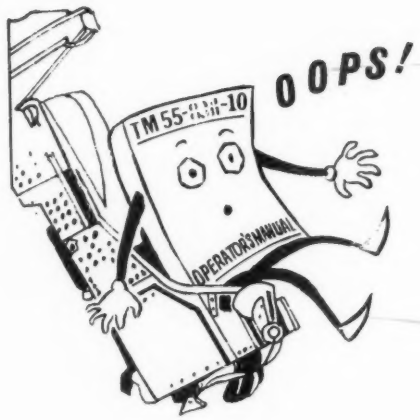
CW2 J. S. B.

Danny's answer: Charlie and I do not like to get into the field of teaching techniques, but we have never failed to answer a question regarding an operating procedure, so here goes. Do you have a copy of TM 1-260, dated May 1965, available? If so look at page 5-10 and figure 5-2 which shows different ratios of descent and air speed. For distance range it shows 60 to 70 mph with 60 mph being the optimum since it has the slowest rate of descent for that air speed range. For the slowest rate of descent, disregarding distance, the speed range is 40 to 50 mph with 45 mph giving the slowest rate of descent. For the best precision range, which should require the least amount of control movements, it shows 30 to 40 mph with 40 mph having the slowest rate of descent for that particular range. So for the best control factor and a willingness to accept a slight increase in the rate of descent, 40 mph would be the optimum speed when you combine the best precision and slowest rate of descent range. I agree you might use 60 mph for your best range until a suitable landing area is reachable; however, from that point and thereafter you are going to select that particular air speed which will give you the most time and control to set your aircraft on your selected touchdown spot. So the figure as quoted in the TM is correct. Hope this clears any doubts that exist in your mind as to the validity of our technical manuals.

Dear Danny and Charlie: I have just been transferred to a unit that has OH-23s and was given a TM 55-1520-206-10, dated October 1965. Is this the latest on this aircraft? Do you have any future plans for the manual?

WO1 A. I. S.

Danny's answer: Your letter appeared at a perfect moment. The manual you have is the latest; however, the dash CL and the dash 10 are being rewritten and new ones should be distributed in the near future. Anyone having a suggested change to the 1965 manual is urged to send it in as soon as possible. As you can see from the date of the manual, not too many of your buddies either read or care about it being up-to-date. How about building a fire under them? Your assistance is needed and desired on maintaining all manuals. So submit a change whenever you think it's appropriate regardless of the date of the manual.



Dear Danny: In reading TM 55-1520-210-10, chapter 2, on the engines it lists L-11 and L-11B engines. What is the difference and how can I tell which one is in my aircraft?

CPT G. E. P.

Danny's answer: A good question and I had to do some digging myself. There is no difference in the external dimensions of the L-11 or L-11B engines—all of it is internal. The L-11 engine has a K-2 gear reducer with 24 teeth. The L-11B has a K-4 gear reducer with 26 teeth which is much stronger and more sophisticated than the K-2 gear. The L-11B also has a larger output spline shaft. The L-11B internal assembly can absorb more shaft torque and has a longer life factor. The only way you can tell which one is in your aircraft is to check the model number on the data plate of the engine. We hope this answers your question satisfactorily.

Dear Danny: I understand that on the "A," "C" and "D" model Mohawk external stores located at stations 5 and 6 cannot be jettisoned with the emergency stores release handle if the detonator squib is not installed in the Aero 15 rack. Is there any way

that I can determine during preflight whether the squib has been installed?

MAJ J. C. M.

Danny's answer: You can't. Neither can you tell whether there's powder in your ejection seat cartridge. You'll just have to trust that the maintenance types did their jobs.

Dear Danny: We just received the new U-6 operator's manual and think it's great, but why were all the takeoff and landing distances with 30-knot winds removed?

J. P. W., DAC

Danny's answer: You must be a ground school instructor. In practice, the only time "Peter Pilot" could use that information is when he's flying off an aircraft carrier, and there just aren't many Army types flying U-6s off flattops these days. Seriously, wind information on takeoff and landing charts is next to useless and will not appear on revised charts appearing in the operator's manual.

Dear Danny: In Mohawk flight school we went through a ground emergency exit drill in which the IP stopped the aircraft and we scrambled out as fast as possible using the side hatches. I have a friend who was involved with testing of the modified ejection seat and he says that getting out through the top hatch is best under crash conditions. If this is correct, why isn't this information in the TM?

CPT G. W. L.

Danny's answer: Your question is very valid and based on the research that it stirred up, an emergency egress procedure will be included in the next change of the OV-1 TM and CL. Joint tests conducted by the manufacturer and the Army show that the fastest way to get out under most emergency conditions (i. e., gear up, nose or belly on ground, fire, etc.) is through the escape hatch. The new CL will reflect the following procedure:

- **Brakes (if applicable)—SET.**
- **Props—FEATHERED.**
- **Fire handles—PULLED.**
- **Escape hatch—JETTISON.**
- **Rocket jet fittings—DISCONNECTED.**
- **Leg lines—DISCONNECTED.**
- **Manual override lever—LIFT.**
- **Abandon aircraft.**

★ ★ ★

Round up all those skeptics in your outfit and make them pay off for telling you it wouldn't do any good to write.

TAC-X

THE TACTICAL CLASSROOM

TAC-X, the final phase of rotary wing training at Ft. Rucker requires the student Army aviator to utilize all the knowledge and skills he has learned. The student plans and executes airmobile missions whose success or failure depends solely on his own abilities

Major Rush R. Wicker

U. S. ARMY AVIATION DIGEST

THE MOTTO "We Try Harder" is not just a saying for the personnel assigned to the TAC-X Branch of the Department of Tactics, U. S. Army Aviation School, Ft. Rucker, Ala.,—*it is a way of life*. The instructor pilots who are assigned to this branch are all combat veterans who have served in the Republic of Vietnam and offer new and better ways of employing the helicopter in counterinsurgency warfare. As a result of these experiences, the program as it is taught represents the very latest in airmobility concepts. It is the responsibility of these experienced aviators to teach the student pilot how to apply his newly acquired flying skills in a tactical environment.

The student pilot who enters the classroom for his initial briefing at Lowe Army Airfield is greeted by a sign welcoming him to the branch which reads: "Welcome to TAC-X, the tactical classroom of the Army Aviation School, known throughout the world as the birthplace of the Army tactical aviator." It isn't long after entering that the student becomes aware that the course of instruction will require him to put to use all the knowledge and skills that he possesses as a student Army aviator. Even more significant is the fact that his leadership ability is being put to the test. Upon the completion of the briefing, students frequently admit that the challenge which is before them is greater than any requirement that the Army Aviation School has presented.

For those who have been appointed to command positions there are many long hours of planning for the combat assault which will be conducted on the first training day. The environment is no longer solely academic; the decisions made by these students will either result in the successful accomplishment of the mission or its failure. The student leader must concern himself with all aspects of the mission such as route of flight, location of artillery base camps, enemy situation, weather conditions, time on target and the utilization of assigned gun teams.

The first operation the students become familiar with is the execution of a platoon size assault with eight helicopters into an area which has been reported as an enemy infiltration route. After departing from the staging area at Lowe AAF, and while enroute, the student aviator is required to contact his artillery coordination center to ensure that his route of flight will not cross the gun target line. Contact also is made with the airborne command and control aircraft to pinpoint the position of his flight and the estimated time of arrival. Although preparatory artillery strikes are programed, it is at this time that the flight is advised that artillery is firing into the landing zone. It becomes increasingly important for the student to exert positive control over his flight and assigned gun teams.

Through careful planning the student leader attains separation within the flight, for he knows that the landing zone will only safely accommodate one helicopter at a time. The first lift should be setting down ± 15 seconds of the scheduled "H" hour. Dropping off troops and departing as rapidly as possible is a very important teaching point and is soon realized when the trial helicopter calls on short final. Additional troops have been prepositioned in a nearby secure pick-up zone (PZ) for insertion into the landing zone (LZ). As each helicopter drops his troops he immediately proceeds to the PZ, picks up more troops and returns again. An overall view of the exercise shows aircraft landing in the LZ, picking up troops in the PZ and others enroute to these two locations. This operation is called a "daisy chain" and is a common occurrence in Vietnam.

Within the area of operations four missions involving 48 helicopters are conducted simultaneously.

The TAC-X facilities, located 25 miles from Ft. Rucker, recently were enlarged

Students practice rapid refueling during operations at the Jungle Warfare School

Every effort is made to recreate as nearly as possible an actual combat situation. Artillery simulators are detonated on the ground, aggressor troops play the role of enemy soldiers and gunships report positions of enemy fire. This plus the added comments of the instructors, contribute to a realistic and effective training environment.

The requirements that have been placed upon the students are difficult and in many cases result in an unsuccessful mission. It is only through this experience that the students are able to profit by their mistakes.

Throughout the initial week of training students are confronted with basically the same type of missions outlined. As the program advances the problems become increasingly more difficult and less assistance is provided by the instructor pilots. The climax of the first week of training is reached when the students are required to conduct the entire mission solo. The operation is entirely planned and executed by the students. The results are reassuring since the operations are normally well planned and conducted in a professional manner.

Flying helicopters and conducting combat operations are only part of TAC-X's contribution to the student's education. Located southwest of Ft. Rucker is an Army base camp typical of those found in Vietnam. It is here that students are exposed to a field environment. The students live in tents and eat at a field mess. Activities such as operational briefings concerning anticipated combat operations, physical training and academic instruction occupy the student's time.

A true Vietnamese atmosphere would not be complete without an alert. On the fourth day of training in the field the base camp is "hit" by the enemy and students are briefed ahead of time as to where they must report. Less than 30 minutes after the alert has been sounded the rotors of 48 helicopters are turning in preparation for a night combat assault.

On Monday of the second week the operational area shifts from the immediate vicinity of Ft. Rucker to the Jungle Warfare School located 25 miles northwest of Fort Walton Beach, Fla. Here, students learn to conduct actual troop lifts. Information is received that aggressor forces are about to overrun the Ranger camp and that the 130th Aviation Battalion will provide the airmobile assets to counteract this threat. With this information the students are required to plot their course and establish their command and control procedures. Lift-off is planned at first light. Two companies of 24 helicopters each participate in the exercise. The trip, which takes an hour's flight time, is quite educational for many of the students find navigation at an altitude of 100 feet difficult.

On arrival in the area of operation, the helicopters land at a secure staging field where the students practice hot refueling. This

type of refueling system is common in Vietnam but is practiced stateside only by students at the Army Aviation School. Once the helicopters are refueled, they proceed directly to the first pickup zone for the extraction of Ranger forces. The terrain over which they fly, as well as the landing sites, closely resemble those found in Southeast Asia. Here again the student learns the importance of getting into the pickup zone and departing as rapidly as possible. This point is driven home when the aggressor force begins to appear around the perimeter of the pickup zone.

As liftoff is initiated, the student becomes aware of the fact that flying a fully loaded helicopter requires greater skill and better judgment. Once airborne, the countdown begins and the student flight leader must exercise positive control over his gun and troop ships. The airborne command and control ship advises that an air strike is in progress and that naval gunfire is imminent.

Following the artillery preparation, the armed helicopters expend their ordnance on enemy positions in the landing zone. If the student flight leader's planning is good, the first flight of eight helicopters will arrive in the landing zone exactly at the designated "H" hour. It is at this point that an appreciation for the smoke-generating helicopter is realized. The smoke that has been emitted has significantly limited the enemy's ability to place effective fire upon the troop-carrying helicopters.

No sooner does the last helicopter in the flight set down than lead begins his climbout. The time interval between the first and second element's arrival in the landing zone has proven time and time again to be of utmost importance. The leader of the second flight must plan his arrival just as the last ship of the first flight lifts off. If additional reinforcements are needed, a daisy chain will be formed and troops will be shuttled into the landing zone as quickly as possible. This type of operation is conducted by each company and the final analysis reveals that the employment of Army aviation has provided the ground commander with the flexibility required to outmaneuver the enemy and destroy his will to fight. On the following day the class participates in a similar assault at Ft. Benning, Ga. Officer Candidate School and Noncommissioned Officer Academy personnel enrolled in Ranger training participate in this activity.

The operation that TAC-X has become most famous for is the flyby. This maneuver is performed on the final training day. To many this expression of professionalism is more significant than the closing graduation ceremonies. Wives, relatives and friends of the student aviators assemble on the parade field to observe the flyby activities. At precisely 1600 hours the lead helicopter of a formation of 48 passes overhead. Many of the spectators are jubilant; others may just sit, feeling pride in the fact that their son or husband is flying in the formation. A sudden change in the spectators is observed as the mass of the formation passes and the band plays the "Army Aviation Song." Simultaneously, two helicopters flanking the formation begin to eject large columns of smoke. Everyone seems to be amazed that so many helicopters can fly so close together and maintain uniformity throughout the formation. One cannot help but feel proud as the scene unfolds. One student expressed his feelings in the following manner: "When I flew by it made me feel proud to be an Army aviator."

Students at TAC-X are exposed to quarters similar to those in the Republic of Vietnam

As luck would have it, the hole closed up when we started through

AT 0230 THE first incoming round hit near the division artillery command post and woke me from an uncomfortable sleep as I sat in the left seat of a UH-1C on "hot status." A second later the field phone was in my hand and out came the two words anyone in an aerial rocket artillery (ARA) battalion dreads to hear in the middle of the night: *fire mission!*

Before continuing, let me set your mind on the right track to facilitate your getting the most out of my story. In CONUS, VFR minimums have been established through many years of experience and research. These minimums are set up as guidelines and, if abided by, will save many lives because they can be used to better clarify the grey area that sits just above minimums. This grey area, when approached by pilots on the short end of experience, tends to place them in a quandary. Inexperienced pilots will stretch minimums to a dangerous degree to maintain VFR flight, and that is when the inevitable accidents occur.

Now back to my "nightmare fire mission." I immediately threw the phone out of the aircraft and cranked my UH-1C. As my copilot was strapping in, I yelled over the intercom for the crew chief to clean off the windshield.

I received takeoff clearance and, even though it looked a little soupy, I made a takeoff from our pad. I broke out at 400 feet AGL (above ground level) and realized that I had just made an instrument takeoff without the aid of instruments. This necessitated an apology to my crew chief for having accused him of not cleaning the windshield. I couldn't see clearly through the windshield because of the 400 feet of dense fog.

We received our mission from operations and were to orbit Hue Citadel until the division artillery light observation helicopter (LOH) joined up to search for the Viet Cong rocket position. Enroute I made a mental note to keep an

IT WILL HAPPEN TO YOU!

Captain Paul N. Phillips Jr.

eye on the Phu Bai airstrip southeast of Camp Eagle so I could get down before the fog closed it.

A few minutes later a call came over our UHF, "Dragon 31, this is Gunner's Eye off your right wing at 5 o'clock."

About time I thought. "How about a position and clearance to fire? Over."

The reply was the same old frustrating thing you frequently get in Southeast Asia, "Position pinpointed, negative clearance."

I remained calm and kept my thoughts to myself this time. Wouldn't you know it! They wake us out of a comfortable sleep, we get off the ground safely by the grace of God and then we bore holes in the sky and burn up fuel.

After orbiting for 30 minutes awaiting clearance to fire, I decided to fly toward Phu Bai and take a look at the strip. I could see nothing but the white cotton-like layer completely engulfing the airport and knew I had better find another place to land. I immediately called Phu Bai tower, which reported less than 1/8 mile visibility and the airport closed. The tower operator asked if I wanted to declare an emergency and get a GCA (ground controlled approach). I decided against it for the time being since I had 450 pounds of fuel on board and I could still try Camp Evans airstrip about 15 minutes to the north.

I rejoined the LOH over Hue Citadel and informed him of the weather conditions over Phu Bai. He requested an end-of-mission from division artillery so we could depart station and seek a clear landing strip.

I continued to call Evans tower without success, so I asked Eagle tower for a recent weather report from Evans. But, Eagle hadn't heard from Evans for quite a while.

My copilot thought we should fly to Evans and hope for clear weather or shoot a GCA to Phu Bai. The decision was difficult because we had only enough fuel to get to Evans and would have to land there even if the weather was zero-zero.

Gunner's Eye called that we had an end-of-mission and that he was going to fly around Camp Eagle to see if it had cleared up. I told him we would join him, as I had decided that we were not going to fly to Evans without a weather report.

With 200 pounds of fuel, a flickering 20-minute fuel light and no change in the weather at Camp Eagle or Phu Bai, I was beginning to get a little worried. Just as my 20-minute light began to burn bright, the LOH saw a light somewhere in Camp Eagle. He flew into the edge of the fog to check it out and then he came over the radio again, "31, there is a hole here that looks big enough to get through but it is going to be tight." Elated, I told Gunner's Eye that I would be right behind him.

As luck would have it the moment we started through the hole it closed up tight. There was no turning back for the LOH pilot, with me right above him, so he continued and I followed a very dim rotating beacon through 400 feet of ground fog.

On the way down I experienced vertigo three times and tried to fly by the seat of my pants. Each time I felt my copilot fight me on the controls because he was on the instruments and thankfully kept me from inverting the aircraft. Our time in the fog was about 20 to 30 seconds but it seemed like an eternity. We landed behind a mess hall on a 15- to 20-degree slope.

I have never been so happy to get my feet on the ground in all my life. The preceding might be considered a war story by many but to me it means only one thing: *never try to fly VFR in IFR conditions.*

Prior to this incident I had read several stories very similar to mine and thought to myself that it would never happen to me. Well, I was wrong. All my fear and the fact that I cheated death that night could have been alleviated had I just decided to overcome my fear of actual IFR conditions and gotten a GCA to an Air Force strip 200 times the size of my makeshift landing pad behind the mess hall.

Add this story to others you have heard or read about on this subject and perhaps through the repetitiveness of these incidents you will choose the proper course of action when confronted with such an IFR situation.

Good luck, and remember, it *will* happen to *you!*

MISCELLANEOUS RAMBLINGS ON . . .

An automobile as a piece
timely maintenance. It mak
an integral component or b
chase a tank or dress as pi
'the other guy," but certai
matter what equipment you
feel, remember the first rul

MOST AVIATORS give a lot of thought and spend considerable time studying aviation safety. Often this study time is involuntary but, nevertheless, at some time or another they usually have been in situations where serious injury or damage was averted through this frequently "monotonous" knowledge.

As a result aviators are aware of what aviation safety can do, but they likewise are aware of what a similar type of safety can do when piloting a 500-horsepower, dual exhaust, fire-breathing, gas-eating automobile that can outaccelerate an AH-1G HueyCobra and cruise at 120 knots.

A person who spends only 10 minutes a day driving to and from work logs over 80 hours of driving time in 1 year. If annual minimums were required for automobiles, he'd be "uptight" just by driving to and from work—it would be all "first pilot" time, too. There also would be a great deal of actual instrument time logged driving around in the fog, rain and snow. But how many drivers are "instrument qualified" and how many vehicles are IFR equipped (fog lamps, adequate windshield wipers, instrument lights, side reflectors, etc.)?

A rotating beacon on a vehicle might be a good idea, but the constabulary would probably take unkindly to this gesture of safety. Those new strobe beacons that civil aircraft are using are outstanding, but they would be dangerous if flashed on in the opposite lane.

The Preflight

What about maintenance? When was the last time your automobile was preflighted? A preflight isn't necessary every time a vehicle is started, but it should be performed at least once every day or so. It doesn't take long because there isn't that much to check; however, brakes, lights and horn should be on the daily checklist. Engine oil level, brake fluid reservoir, radiator, fan belt, battery water level, tire pressure and the general security of moving parts (tire lugs, fan, etc.) should be checked weekly. Any evidence of fluid leaks, rust in the exhaust system, faulty insulation on wiring harness, water in lamp receptacles and other various and sundry items should be noted and corrected. Many automobiles now have owner's checklists in the back of the owner's manual (dash 10). It should be read carefully.

Happy Hour

Aviators know the consequences of taking a few drinks before fly-

AUTOMOTIVE SAFETY

Captain William H. Brittain Jr.

Photos by CW4 Bill C. Walton

e of machinery requires proper and kes no allowances for a loose nut in behind the wheel. One need not pur- ictured below to protect himself from in practices serve as guidelines. No u use or how securely strapped in you le is not to become "that other guy"

ing, but what about those two or three happy hour drinks before the same man hops into his vehicle to log some night time? One excuse heard runs something like, "My car only operates in one plane (two dimensions) while my aircraft operates in two planes (three dimensions)." That's fine, but think about driving down a two-lane highway with a speed limit of 60 miles per hour. That guy in the other lane has an apparent approach speed (your speed added to his) of 120 mph (if he isn't breaking the limit) with maybe 3 to 4 feet of clearance between cars. If that's not bad enough, this can happen 400 to 500 times every 30 minutes on a heavily traveled road. Also, there's no such thing as high radar approach control or tower operations. You're on your own!

It has been charged that one out of every five drivers involved in an accident is under the influence of alcohol. Of course, the local pub can't be closed, but it would be cheaper both in terms of the old pocketbook and in human lives to mix the drinks at home and then stay there. But if it's necessary to enjoy a few drinks at the club before going home, why not have the little woman pick you up after happy hour or get a friend who's not "three sheets to the wind" to give you a lift?

Tires

Most drivers know about the fantastic holding power of the radial ply tire. With a set of these little jewels, one can brake his vehicle to a stop faster than an OV-1 Mohawk with its reversible props and air and wheel brakes. And he can outturn a UH-1 with antitorque system failure.

The radial ply tire does not have the slip that a conventional tire has in its sidewall area. When the steering wheel turns to a new direction, the sidewall flexes and the tread area tends to remain on the original course. This could be compared to making a pedal turn in a helicopter at cruise speed. The helicopter points its nose in the new direction but it takes a while before it starts to fly on that heading.

A radial ply tire has very little lateral play in its sidewalls. It has more flex in the sidewalls in the direction which bisects the center of rotation, thus giving it a bigger footprint (more surface area in contact with the ground) and, consequently, more traction. When a radial ply tire is turned in a new direction, it almost immediately takes up the new direction just as a nicely coordinated turn in an air-

Above: A sharp pencil point serves as a measure of remaining tread life. Right: Periodically check security of lug nuts or knock-off hubs

craft. However, even though a radial ply tire is superior to a conventional bias ply tire, it has two inherent dangers which can place a driver in a pine box just as quickly as a minigun at point blank range.

The first danger is like mixing alcohol and driving; it is best if not done at all. However, radial ply tires and bias ply (conventional) tires can both be used at the same time on the same automobile *but only in one configuration;* i.e., put bias ply tires on both front wheels and radial ply tires on both rear wheels. The reasoning behind this is that bias ply tires tend to break traction in a turn or on a slippery surface before radial ply tires. In a turn the rear wheels of an automobile have the tendency to break loose before the front wheels, but if radial ply tires are on the front wheels and bias ply tires on the rear wheels, the rear wheels will break loose into a skid while the front wheels remain in contact with the road. This results in all kinds of weird reactions. Also, if three conventional ply tires and one lone radial ply tire are used, the same thing can happen with even more disastrous results. Of course, the same thing applies to three radial ply tires and one conventional ply tire.

If both a radial ply tire and a bias ply tire are used on either the front end or rear of the car, heavily unbalanced stresses result and materiel failure is likely to occur. A check with a major insurance company reveals that if an automobile having a 3-to-1 bias ply tire to radial tire setup is involved in an accident, the insurance may be invalidated. If it is necessary to use a spare tire, which

With the help of a friend check all the signal lights

Check wheel bearings for lateral play

is the only bias ply on the car, drive slowly and with extreme caution only as far as necessary.

There also is danger involved when using radial ply tires on all four wheels. When rotating tires the common practice is to rotate in an X configuration, i.e., left front tire switches with the right rear tire and the right front tire with the left rear tire. This is a "no-no" with radial ply tires. When a radial ply tire gets broken in, the sidewall cords tend to flex in the direction opposite to the direction of rotation. This is caused by the tire's center having a tendency to rotate faster than tread portion. If a radial ply tire is rotated from one side of the automobile to the other, the direction of rotation is reversed. This causes wear of the sidewall plies in the opposite direction which can cause premature failure of the sidewall plies—a situation comparable to losing a main rotor blade at 2,000 feet absolute.

Another grave danger is the addition of spring shackles used to displace the center of gravity rearward during acceleration. Unfortunately, they also raise the center of gravity making the automobile unstable and enhancing the possibility of flipping the car in a turn. Stock automobiles are designed to minimize roll. Consequently, any device which changes the center of gravity also may invalidate one's insurance.

Many books have been written on automotive safety and others will be written as society becomes more and more dependent on ground transportation. Chances of survival can be a lot better in the air than on the highways. Think about it.

Forward motion is efficiently stopped by the application of brakes. Watch the level of brake fluid in the reservoir

Right: Maintain sufficient water in the radiator for proper cooling. Below left: The general condition of front and rear suspensions and steering systems should be checked regularly. Below right: Shackles may enhance pickup performance but detract from general stability of car on road

Aviators have a moral obligation to protect their crew members. Through briefings and constant prodding, they may be able to limit and prevent senseless injuries and deaths . . .

An Obligation to

HOW OFTEN have you added the vital check of ensuring your crew chief and door gunner are properly strapped in when running through your pretakeoff and prelanding checklists? After 10 hours or more in your seat, it's an accomplishment to run through the entire list, much less add to it. Yet, in cargo and troop-carrying configurations of UH-1Ds and Hs, for example, unless crew members are fastened, and fastened securely, their chances of crash survival are virtually nonexistent.

While there have been cases in which crew members miraculously survived accidents, unfortunately the majority of injury-producing accidents result in a gamut of injuries ranging from minor contusions to the maximum—which no aviator cares to have on his conscience. The problem is further aggravated by lack of support from the very people aviators endeavor to protect. How often have pilots remembered to ask their crews if they were fastened in and they responded affirmatively, when they were not? "Sir, you don't have to ask every time. We're always straight back here." When was the last time you actually looked around to check?

Aviators are always strapped in, not only at the waist, but over the shoulders as well. Even if they don't have their inertia reels in the locked position, a simple flip of a lever conveniently placed at the side of their seats will secure them in place. However, let's consider the responsibility aviators have for the rear of their aircraft. The simple truth is that the type of seat belt provided affords minimal protection to occupants, not only if a UH-1D or H, for example, turns on its side, but also if impact is experienced with any amount of forward motion. As the occupants sit facing 90 degrees to the front, they can't seriously expect to be held in place and intact with a two-inch belt, generally loosely fastened, if at all, around the waists of the door gunner and crew chief.

Every aviator can probably recall, some all too vividly, examples of crew members sustaining injuries from crashes. Following are several instances illustrating the need to protect crews from their own folly.

Recently, a command and control helicopter was overseeing an aerorifle platoon operation of an air cavalry troop. Apparently, the interest of the aviators was too intent on the operation. The pilot overflew an enemy position, received fire and made a forced landing in a fairly open area that was blanketed with elephant grass, concealing several dikes. A rough landing was accomplished and the slightly crippled helicopter hit one of the dikes head-on. The right door gunner was thrown against the seat brace to his left, fracturing his arm. Questioned later about whether he was wearing his seat belt, his reply was all too common. "Sir, I didn't have time to fasten it. We were too busy trying to suppress the ground fire."

Another favorite argument against perpetually wearing the seat belt is that crew members cannot effectively clear the tail and underneath sections of helicopters, particularly in tight landing zones. While suppressing fire, it's admittedly impractical for gunners to be fastened so tightly to their seats that they can't see their targets or shoot their door-mounted weapons. These are very salient and valid arguments until a helicopter impacts and a crew member is injured.

Immediately following a troop insertion into a difficult landing zone in the mountains, while over a dense rain forest, a UH-1H pilot experienced engine failure. Finding no suitable forced landing area close enough to reach, the pilot autorotated to the treetops. All air speed was dissipated and the helicopter was cushioned into the trees, halting the main rotor. As it settled through the jungle canopy, it tipped onto its right side and came to rest on the floor of

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CREW MEMBERS

the forest in medium undergrowth. The aircraft commander and the crew chief scampered out, slightly dazed, but unscathed. The pilot escaped with a cracked collarbone. The door gunner was not quite as fortunate. He fell from the transmission well and hit his head, sustaining a concussion. Questioned later, he reported his seat belt was fastened, *but not tightly*.

During an offensive last spring, a UH-1 landed at the base camp of an armored squadron. Reaching translational lift during takeoff, the pilot spotted two strands of commo wire strung across his path. When he tried to avoid the wire, the helicopter hit the ground, severing the tail section and separating the main rotor. It bounced and rolled onto its left side. The crew survived, *except the crew chief who did not have his seat belt tightly fastened*. He fell out during the crash and the roof of the Huey fell on him, crushing his head. Investigation revealed the interior of the helicopter completely intact, including the transmission well where the crew chief was seated. Generally, this crew chief fastened his belt and observed regulations. This day he was lax about observing the rules because he had been awake the entire night before replacing the engine. The accident occurred too quickly for him to react.

Every aviator the world over is responsible for protecting his crew members. Normally, an aviator would never consider lifting off unless his crew was completely outfitted in flight suits, protective helmets, boots and gloves. But how often do aviators ask their crews if they are securely fastened in their seats?

One cavalry unit added the following additional checks to existing checklists, the last of particular significance: (1) Cargo doors back and pinned or closed and latched; (2) Weapons systems cold; and (3) Crew member seat belts on, fastened and tight. While not officially a part of the standard checklist the last check does ensure crew members are in place and reasonably secured.

Another suggestion, probably the most obvious remedy, is implementation of an inertia reel and shoulder harness to retain crew members against the transmission well wall. It has been pointed out in many investigation reports that, had crew members been held against the inside walls of the aircraft, they would have sustained minimal injuries. In the released or relaxed position, an inertia reel would conceivably allow the freedom of movement required by crew members to accomplish their duties. Even in this position, the reel would lock upon impact, preventing the person restrained from falling out of the aircraft. Implementation of the inertia reel and ensuring the shoulder harness is in the locked position for takeoffs and landings would greatly enhance the safety of crew members.

If a shoulder harness installation cannot be incorporated in the Huey interior configuration, a visual and audible check can be incorporated into checklists, specifically oriented to the crew for use prior to takeoffs and landings. This would at least ensure that crew members are securely fastened to the helicopter.

Another alternative to prevent personnel from falling from helicopters should they tip over on takeoff or landing is to confirm that sliding cargo doors are securely fastened in the closed position. (This is impossible for combat assaults when the smaller cargo doors to the front are taken off and stowed for easier exit and entry.) Under normal conditions, however, sliding cargo doors could be closed, keeping personnel inside, no matter what attitude the helicopter assumes. The old argument that these doors retard escape in the event of fire is unfounded, since the windows in these doors can be used for emergency exits.

In addition to preventing occupants from falling out, closed doors would restrict branches, dust, rocks and other foreign objects from entering the cabin. Tree branches have blinded several individuals while helicopters were descending through jungle canopies. Other injuries have been sustained by gunners falling against door-mounted M-60s or having their M-60s pushed in against them. Closed doors could, in part, protect crew members from these types of injuries. Aviators have enough to do and think about without having to remember about closing cargo doors. But thorough and periodic crew briefings could entice crews to think about this type of preventive measure.

Another alternative would be to change the seating position of gunners so they would be at a 45-degree angle to the side back wall corner. Should the helicopter roll over on its side, their bodies would tend to fall against the back wall of the compartment first, instead of directly out against their weapons or, worse, completely out. This proposal, though not very drastic, should be studied for its impact implications.

Aviators have a moral obligation to protect their crew members. Through briefings and constant prodding, they may be able to limit and prevent senseless injuries and deaths that result from laziness and improper protective measures. Repetitive reminders may seem boring and ridiculous. However, it is readily apparent from crash facts messages and accident reports that some crew members are not wearing seat belts or wearing them improperly. What's the last item on YOUR checklist?

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HOT Refueling Operations

UH-1s AND AH-1s are a unique breed to refuel while running. One reason is the precarious positioning of the fueling post. It's mandatory to keep the hose nozzle well into the post to prevent fuel from being sprayed into the intake or on the exhaust portions of the engine. Fuel vapors escaping during the refueling are dangerous enough without inadvertently hosing fuel onto the engine.

A new AH-1G was recently destroyed by fire when the copilot, who was refueling, slipped from the step. As he fell backward, fuel spewed onto the hot engine, through the air intake portion of the cowling, and subsequently through the turbine, causing not only a fire, but a severe overspeed as well. Fortunately, the pilot at the controls had his canopy closed and escaped a JP-4 bath and the flash fire which engulfed the helicopter. When the intense flash fire subsided slightly, he shut down and escaped unharmed.

Each unit should have a safe and workable refueling operation outlined in its SOP. Aviators, crew members and maintenance personnel allied to aircraft operations should be thoroughly familiar with the do's and don'ts of hot refueling.

Pilots can help prevent hot refueling accidents through several measures. After the pilot who is to supervise the operation unstraps, it's important for him to ensure that all crew members have their sleeves rolled down, gloves on and helmet visors down. If one of the crew is unable to comply, he should be moved a minimum of 60 feet from the helicopter until the operation is completed. Another very important pilot responsibility is to make sure a fire extinguisher is close to the fueling post, that the hose is grounded at the nozzle and the helicopter grounded at the skid.

While overseeing the refueling operation, the pilot can perform other important functions. He can open the inspection hatch, checking for leaks in fuel lines, oil lines and seals, as well as material or mechanical failures or signs of wear, including engine mounts. The hydraulic fluid level can be checked. Bear in mind this level will appear slightly low while running. The overseeing pilot can then check under the tail and under portions of the helicopter. He can check the levels of the 45-degree and 90-degree gearboxes. Watch that tail rotor!

How about the pilot seated in the helicopter—is his visor down? One rule generally found in SOPs and often violated is that no radio calls are to be made during a hot refuel. Though there's little proof pro or con, there's a good possibility, particularly with FM, that static electricity will be generated and occasionally emitted. This could cause a spark.

You should always check for fuel contamination. However, a check of the color and flow of the fuel must often suffice in the combat environment. Cleaning the nozzle is generally necessary and should be accomplished.

When refueling is completed, the crew member refueling must replace the post cap securely. If not, it's easily lost in flight, allowing fuel to spill out onto the fuselage and create a hazard. The crew member should take the time to replace the cap into the post, turn the lever completely to the stop, then snap it flush to the fuselage. He should ensure that *both* grounding wires and the fuel hose are fully clear of the skids before departure.

From 1 July 1967 through 31 December 1969, there were 16 hot refueling mishaps reported—eight major accidents and eight incidents. These resulted in five fatalities, four serious injuries and a cost of $1,332,310.

Each aviator, realizing this type of operation is extremely dangerous, seeks to find a remedy. Happily, there's one on the way. A new fuel nozzle and fuel post have been designed and are currently being installed and retrofitted into all new and existing UH-1s and AH-1s. The nozzle, complete with a one-way valve, will fit into the fuel post much like a cannon plug, half turning into a lock position. Once locked into the post, the valve will be free to open and allow fuel to flow. When the fuel cells are full, or, at a predetermined level, it will shut off. If the nozzle is turned to the open position, the valve self-closes, shutting off the fuel flow through the nozzle. Until this new system is fully implemented, previously outlined measures must be observed. With a concerted effort, unnecessary hot refueling mishaps can be prevented. Further reference can be made to TM 10-1101, chapter 6, section 5, 13 October 1969, for procedures to be followed by crew members.

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REVIEW OF BASIC HELICOPTER INSTRUMENTS

A UH-1H crew completed an emergency medical evacuation mission at night and flew toward their home base in marginal weather. As they approached a peninsula, they turned seaward to fly around the coast and the copilot attempted to maintain VFR by glancing backwards to see the shoreline and lights and alternately coming back to the instruments. When the crew chief yelled they were too close to the water, the copilot looked back at the instruments and attempted to pull in more power. It was too late. The helicopter impacted the water and sank. Three members of the crew drowned. One member survived by clinging to a buoy until he was rescued. The accident report stated: "Although the pilot and copilot had current rotary wing tactical instrument tickets, it is suspected they hesitated to climb out under instrument conditions due to lack of confidence and experience and extended the flight under visual conditions beyond their capability."

ANALYSIS OF fundamentals is essential for successful completion of any course of instruction. Helicopter basic instruments are no exception. The problem faced by the student during this phase of instruction is twofold. On the one hand, he is introduced to a new environment to which he must readily adapt. On the other, he must develop confidence in his instruments and a high degree of proficiency in his cross-check. Control touch, instrument interpretation, cross-check and aircraft control are areas which require thorough understanding from the very beginning. Analysis of common problems should help you to develop an insight that will make the task easier.

The basic concept of instrument flying is that the pilot must control the helicopter's attitude and power, as required, to produce the desired performance. Since the attitude indicator and power indicators (rpm and manifold pressure gauge in the TH-13T) are cross-checked to control the helicopter, they could be appropriately called the *control* instruments. The helicopter's performance is determined by the *performance* instruments (altimeter, air speed, vertical speed, directional gyro and turn and slip indicator). With this basic classification, we have two major groups of *control* and *performance* instruments. Proper control of one group will result in correct performance of the other and of the helicopter.

A point of interest is the absence of lag in the *control* instruments, compared with the inherent lag of the *performance* instruments. Knowledge of this should result in an easier cross-check. The inherent lag of the performance instruments comes from a combination of two factors— their mechanisms and inertia. Inertia manifests itself, for example, as apparent lag in the rate of movement of the air speed needle during acceleration. Pilots should think in these terms: "Apply a correction to the control instruments; hold the correction and wait; correct, hold and wait, allowing time for the helicopter to accelerate in its own inertia and time for the performance instruments to catch up with their inherent lags."

Analysis of the ball component of the turn and slip indicator is of paramount importance. All flying, IFR or VFR, centers around this ball. It must be included in the cross-check often enough to keep the helicopter trimmed. However, it is easily neglected. Watching the turn needle and disregarding the ball is a common error which results in an out-of-trim condition and hinders helicopter performance. In most helicopters, the turn and slip indicator is offset to one side of the pilot or copilot. Therefore, the sight picture, as viewed from each seat, is significant. Remember what *your* sight picture looks like.

The importance of control pressure applies equally to pedals, cyclic, throttle and collective. The basic instrument student must realize that application of right pedal pressure requires a corresponding release of left pedal pressure. Elementary as this may be, it is worth reviewing because this basic technique is essential for smooth trim control. Pedal corrections should be executed rhythmically. Think of pressure instead of movement, rhythm instead of jolts. Power changes in single rotor helicopters require close reference to the turn and slip indicator to ensure proper trim control.

It is important to recognize when a change in attitude (pitch/roll) or power is required. It is equally important to know what to change (pitch attitude, roll attitude, power or a combination of two or all three). Proper interpretation of performance instruments will give the answers. These instruments show the result of the present attitude and power. Therefore, when an indication other than desired is noted, a change of attitude and/or power is required.

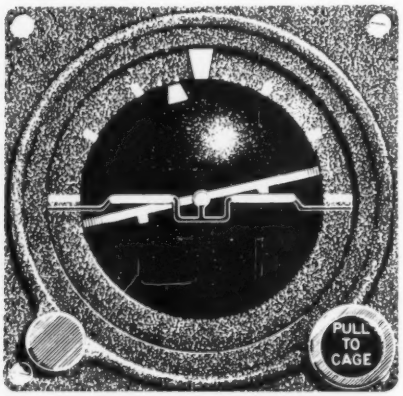
How to know what to change—the bank, the position of the nose or the power—is simple. Bank attitude is used to maintain a heading or a turn. Power control, exercised through changes of main rotor collective pitch, is used to maintain attitude, to correct attitude or to control the rate of climb or descent. Raising or lowering of the nose is used primarily to maintain or to correct air speed. How much to change the attitude or power is, initially, an estimate based on familiarity with the helicopter and the degree you want to change indications of the performance instruments. In the TH-13T, as a rule, one inch of manifold pressure will result in a 100 fpm climb or descent, or a 5-knot air speed change.

After a change of attitude or power, performance instruments are observed, with an allowance made for lag, to see if their indications change as desired. If not, further adjustments of attitude and/or power will be required. Flying by reference to instruments is simply a continuous repetition of this process.

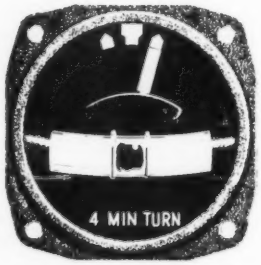
Division of attention between the attitude indicator, performance instruments and power is essential. The attitude indicator is probably the only instrument to which attention may be devoted for any appreciable length of time. It's also the instrument which is cross-checked the greatest number of times. A typical cross-check technique is to glance from the attitude indicator to a performance instrument,

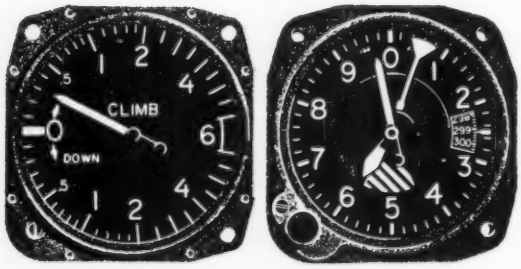
BASIC HELICOPTER INSTRUMENTS

The attitude indicator is the instrument which is cross-checked the greatest number of times



Analysis of the ball component of the turn and slip indicator is of paramount importance. All flying, IFR or VFR, centers round the ball





Cross-check power (rpm and manifold pressure) with the altimeter and vertical speed

back to the attitude indicator, back to another performance instrument and so on. This does not rule out cross-checks of one performance instrument against another. However, effective cross-checks often require the attitude indicator to be inserted between performance instruments being cross-checked.

Beginning students often devote so much attention to one performance instrument they fail to cross-check the attitude indicator, as required to properly control attitude. On the other hand, the problem of too much attention devoted to control instruments (attitude indicator, rpm and manifold pressure) is rare.

Poor heading control is common. The problem is that some instruments are not as eye-catching as others. A 4-degree heading error is not as noticeable as a 400 fpm rate of climb or descent. Heading control may be made easier by aligning the chevrons of the attitude indicator, once the desired heading has been reached, and by cross-checking the chevrons against the RMI to ensure the desired heading is maintained. The sensitivity of the chevrons to small cyclic pressures is eyecatching. Roll control is also easier when the RMI and chevrons are properly cross-checked.

A typical method in cross-check technique is to cross-check the air speed with the dot in the horizon bar of the attitude indicator (pitch attitude check), then cross-check heading with the chevrons of the attitude indicator (roll attitude check); finally cross-check power (rpm and manifold pressure) with the altimeter and vertical speed. Insert the turn and slip at this time (trim control check); then start over from the beginning.

Basic instrument students should strive to develop a touch control that will result in smooth maneuvering. This is called *rhythm*. While it may take one person 5 seconds to roll in a standard rate turn, another may require 8 seconds. Using the chevrons of the attitude indicator, displace the top chevron with cyclic pressure and a steady rhythm when the second hand of the clock passes through a cardinal heading. Note how long it takes for the top chevron to reach the 10-degree mark of the attitude indicator. At this time, glance at the turn needle. Look for a standard rate turn and cross-check once again the position of the top chevron in the attitude indicator. If your turn needle has been calibrated, you're on your way to a good maneuver.

During gyro turns, the time in seconds required to

roll into the turn should equal the time required to roll out. Gyro turns are accurate when uniformity in rhythm is achieved and the number of degrees prior to rollout has been determined by practice. As a guide, lead the desired heading by one-half the angle of bank. Start from there, then determine what is appropriate for your rhythm. The rule of thumb for determining the degree of bank is: Divide the air speed by 10 and add 5. At 60 knots, 11 degrees of bank will result in a standard rate turn; at 50 knots, 10 degrees; etc.

In a more complex maneuver, such as a climbing turn, application of power 5 to 8 seconds before the second hand reaches a cardinal heading on the clock is advantageous during the early stages of training. As the second hand of the clock reaches the cardinal heading at which the maneuver is to be started, cyclic pressure should be smoothly applied in the desired direction and, simultaneously, the dot of the miniature aircraft on the attitude indicator should be positioned one bar width above the horizon with slight aft cyclic pressure. During the entry, close attention should be devoted to the attitude indicator chevrons and dot until the desired climb attitude (50 knots in the TH-13T) is reached. Only then should the dot be positioned on the horizon to maintain the 50-knot attitude as the climbing turn continues.

Once the turn and rate of climb are established, some key words should be mentally repeated. For example, "Standard, fifty, five hundred." The cross-check is remarkably improved by using key words. At regular intervals, cross-check the altimeter and heading and apply corrections to the control instruments as required.

In turbulent air, reference to the attitude indicator is paramount. Reference to the dot of the miniature aircraft, cross-checked with air speed and chevrons cross-checked with the RMI, will ensure minimum fluctuations of pitch and roll. Additional cross-check of power instruments with the altimeter and slight adjustments of power, as required, will control or correct altitude. When a power correction is made, altimeter lag must be considered and time allowed for the correction to take place. A common trend when power corrections are made is to allow the chevrons to wander slightly, affecting heading control. Vertical speed fluctuations are excessive in turbulent air. Do not attempt to correct these indications with power. Instead, refer more often to the altimeter. Concentrate on attitude and your altitude will be much easier to maintain.

Often, after a period in turbulence, beginners may be discouraged. They should accept the fact that the task is harder and welcome the opportunity as good training and valuable flying experience. Impulsive cyclic movements should be avoided. Chasing performance instruments can result in unusual attitudes. The key word here is *relax!*

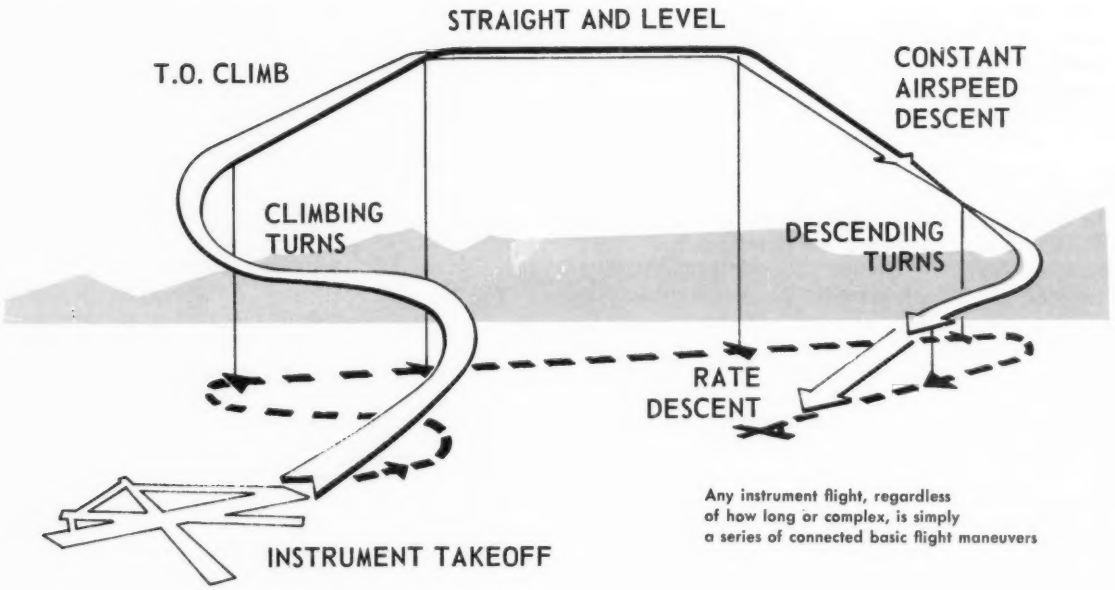
Partial panel heading control becomes easier when the shortcomings of the magnetic compass are understood. This reliable instrument has traits of its own. For an accurate reading, the helicopter must be in straight and level, unaccelerated flight. A glance at the heading in the lubber line should suffice. Chasing the compass card is poor practice. You'll never catch up with it. For turns to odd headings, timed turns work fine, providing control rhythm is consistent during roll in and rollout. For cardinal headings, compass turns are easier.

The point to emphasize is the manner in which the information is gained from the magnetic compass. A good method is to glance at the compass in the same fashion as a flash photo is taken. This habit may be improved with practice. Once this has been done, visualize a compass rose and turn as necessary. When turning more than 20 degrees, use a standard rate turn; if less than 20 degrees, use a half-standard rate turn.

When the rollout heading appears, allowing time for lead or lag, disregard the compass and fly the turn needle for a few seconds. Then cross-check the lubber line heading again. If a minor correction is required, be sneaky about it. This technique will help prevent overcontrolling. Chasing the card unnecessarily is confusing because the azimuths to the right and left of the lubber line have 180 degrees ambiguity. Should a student turn to one of the headings shown in either side of the lubber line, and towards that side, he would turn away from the desired course.

Earlier, the performance instruments were characterized by their inherent lag, and the effects of aircraft inertia were discussed. Fortunately, partial panel is introduced in the last portion of the Basic Instrument Course. In this phase, a student should understand the shortcomings of the performance instruments. When the attitude indicator is covered and the RMI is taken away, only two control instruments are left—the tachometer and manifold pressure gauge. The rest of the instruments are *performance* instruments. Cheer up! The cross-check is now simplified!

BASIC HELICOPTER INSTRUMENTS



Any instrument flight, regardless of how long or complex, is simply a series of connected basic flight maneuvers

The primary pitch instrument in partial panel is the air speed indicator. Consider the altimeter and vertical speed as secondary. The primary roll instrument, the turn needle, is backed up by the magnetic compass. Most overcontrol problems experienced while flying partial panel can be eliminated by use of these key words: "Correct—wait." This applies to the primary pitch instrument as well as to the primary roll instrument.

The air speed indicator for partial panel must be interpreted in another light. Let's call this term *momentum. Momentum,* or the rate of movement with which the air speed needle responds, is greater when the aircraft is operating at lower air speeds. For example, let's visualize a nose high unusual attitude. If the air speed needle were stabilized at 20 knots, a slight forward cyclic pressure will result in a great *momentum* of the needle as it moves to indicate 50 knots. With the air speed needle stabilized at 50 knots, a similar forward cyclic pressure will increase its momentum, but at a lesser degree, as the aircraft accelerates to 60 knots. The ideal way to change pitch attitude in a nose high unusual attitude on partial panel is to increase the air speed, maintaining a steady rate of response (*momentum*) in the needle's movement.

Obviously, additional cyclic pressure will be required as the air speed is increased from 50 to 60 knots. When control pressures are programmed to maintain a steady rate of response (*momentum*) from the air speed needle, the pitch correction is smoothly executed. On full panel, this pitch change is made by positioning the dot of the miniature aircraft one to two bar widths below the horizon and cross-checking the air speed.

Consider a partial panel situation in which a student is given the helicopter for a nose high unusual attitude recovery. As the controls are transferred, he sees the air speed needle decreasing towards 20 knots. Since the needle's momentum is negative—

decreasing—forward cyclic pressure may or may not stop the negative trend. This would depend on its momentum—how fast it is moving towards 20 knots. Forward pressure will stop or decrease the trend prior to needle response in the opposite direction, toward 60 knots. In this case, *instrument interpretation*—which direction and how fast the needle is moving—will determine the success of a smooth recovery. As stated, the needle will respond with greater momentum in the lower air speeds. Once the correction is made, cyclic pressure should be programmed accordingly.

A thorough understanding of the primary pitch control (air speed needle) will not only ensure a correct recovery from unusual pitch attitudes, but will also help with pitch control during partial panel. Understanding needle response will result in a steady air speed in level flight. When a steady air speed is maintained, the altimeter will not be affected by self-induced cyclic climbs or dives and power applications will not be required so often. If required because of turbulence, power changes will be smaller. If this holds true, pedal corrections to maintain trim will be eliminated, or, if necessary, the corrections will be cut to a minimum. It follows that heading control and trim will be much easier!

The turn needle is a poor instrument in rough air. *Acceptance of its limitations* and *tolerance of its behavior* are terms a psychologist would use to analyze this instrument. Let's analyze this instrument's behavior in smooth air. This will lead us to a better understanding in its most stable condition.

Conduct the following experiment: With the turn needle centered and stabilized, apply right or left cyclic movement—*movement,* not *pressure*. The turn needle will deflect in the opposite direction of cyclic application. It will then return to center, zoom past center and accelerate in the direction of cyclic movement. This phenomenon contributes overcontrol problems during partial panel. Application of smooth cyclic *pressure,* instead of *movement,* will cause the needle to react in a similar manner, *but to a lesser degree*. The significance of this analysis is the fact that this is an inherent trend of the needle's behavior in smooth air.

How can this help us? To prevent overbanking a standard rate turn, this lag must be considered while flying partial panel. Cyclic pressure should be relaxed before the turn needle centers under the doghouse. Otherwise, a steeper turn will result. How much to lead depends on the rhythm used, which will vary from one pilot to another. Obviously, a greater lead should be anticipated when maneuvering into a steep turn. When rolling from a steep turn in one direction to a steep turn in the opposite direction, the lead required may be as great as a full doghouse.

Air speed control for partial panel can never be overstressed. This primary pitch instrument controls the helicopter to a greater degree than often realized. If, during a standard rate turn, the air speed is inadvertently increased by 5 knots above that required, a steeper bank will most likely follow. This will increase the rate of descent and result in off-trim conditions when attempts are made to shallow the bank or stop the rate of descent with power.

A good rhythm exercise on partial panel is to race from one steep turn to another, while maintaining cruise air speed. It's common to make a cyclic climb during a right turn while performing this exercise and a cyclic dive during a left turn. Being aware of this will sharpen your cross-check and stress the importance of air speed control as the primary pitch instrument. Altitude control is a collective function. When the bank is increased from shallow to steep, additional collective may be required to maintain altitude.

During rough air flying, the turn needle should not be a cause for disappointment. Basically, no one can control it in this condition. The important thing is to try!

Instrument flying, like any other skill, quickly erodes if it's not practiced and used. You owe it to yourself, your crew and passengers to develop and maintain your instrument flying skill to the point where you will not hesitate to take the correct action when you encounter marginal or IFR weather. When was the last time YOU flew hood or actual instruments?

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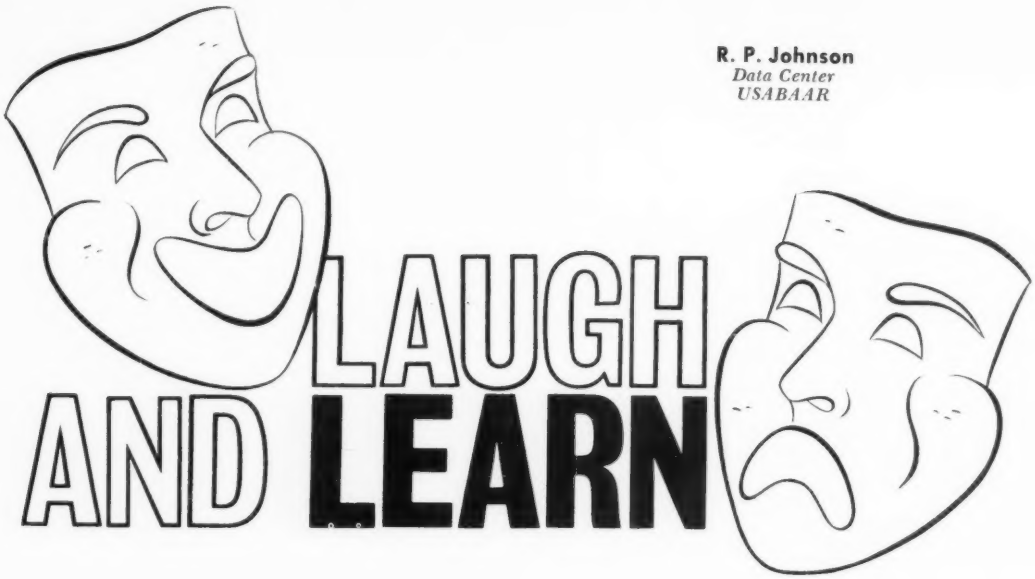
USABAAR



COMMENTS BY accident witnesses are sometimes humorous and often contain a valid description of what caused accidents. These cartoon captions were extracted from Army aircraft accident reports.

◆ "There must have been something wrong with the aircraft to make it bounce so high. I think the pilot had to wait to make his go-around until after we quit bouncing. Then there was not much runway left."

◆ "The landing was real good until touchdown."

◆ "It would have been a real good landing if the gear had been down."

◆ "After we bounced up onto the runway the pilot did a fine job of getting control of the aircraft."

◆ "There must have been a real strong headwind to make us land so far short of the overrun."

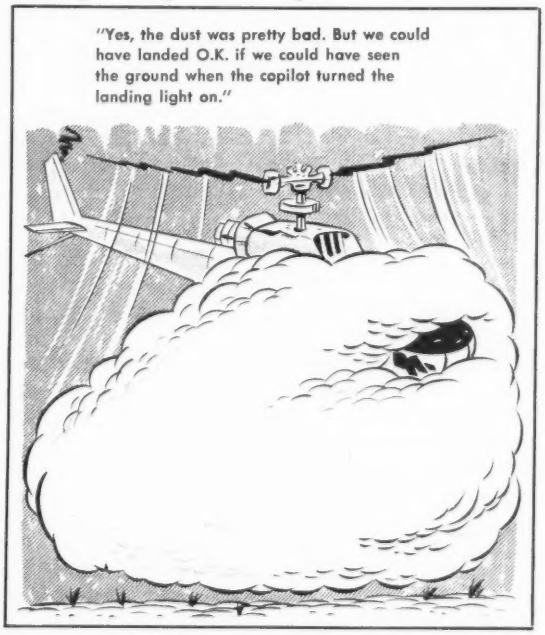
◆ "The pilot would have made a good go-around if the runway had not been so close and tore up both props."

◆ "I depressed the horn button to check for the green lights and that's when we hit the first time."

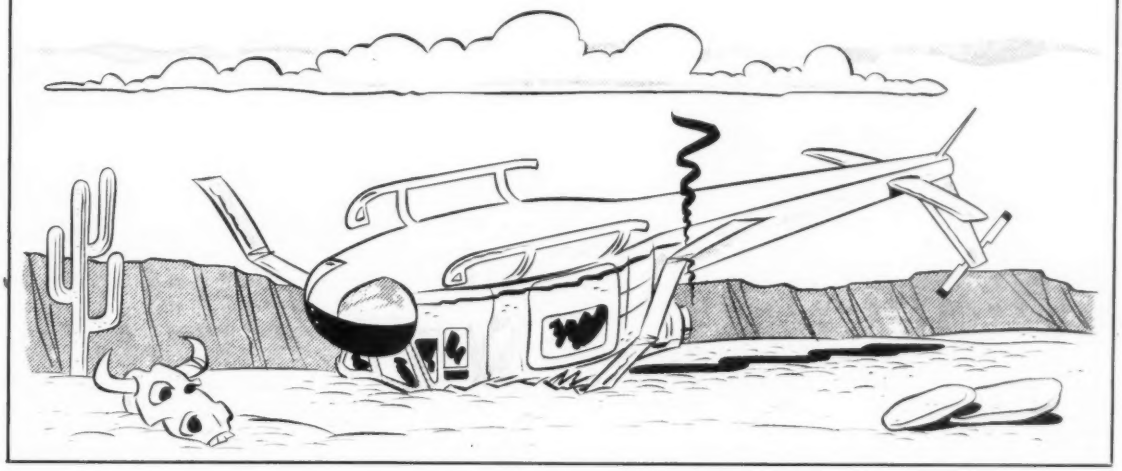
◆ "Failure of the nose gear is what caused our trouble. I think they need to beef up that nose gear so it won't break off every time someone lands nose first like we did."

◆ "The student must have pulled the gear up after I pulled the number two engine on downwind. . . ."

◆ "Yes, sir, I raised the gear because that's part of the procedure when you lose one engine. No, sir, I didn't put the gear down again. The IP didn't tell


"Yes, the dust was pretty bad. But we could have landed O.K. if we could have seen the ground when the copilot turned the landing light on."

"The desert looked real smooth and I needed to practice my landings. Yes, I usually make a high and low recon before I land in a strange area, but I had to get down real quick. You see, my stomach was acting up pretty bad and I didn't think I could make it to my destination. It was still another 10 minutes away. No, I don't usually go on sick call just for an upset stomach. Besides, the flight surgeon wouldn't give me any paregoric and I ran out day before yesterday. I don't suppose you could call it a real forced landing. There wasn't anything wrong with the helicopter until the skids dug into the sand and it flipped over."



me to. Besides, I was all set up for a single engine go-around if he had given me one. I like to stay ahead of the aircraft whenever I can."

◆ "Yes, sir, I'd fly with him again, anytime, anywhere. He's very conscientious about preflights and such. If we hadn't run out of gas, it would have been a fine flight. He went into autorotation almost right away and everything would still have been O.K., except for the fence at the far end of the field. If we could have cleared the fence, the next field was just as good as the one we tried to land in. Once our skids caught the fence and flipped us over, he sure did an outstanding job of preventing us from being killed. I think they ought to change the glide on that model helicopter. Either field was big enough, except right there where the fence runs between them."

◆ "The pilot did a very skillful hovering autorotation after the revetment knocked our tail rotor off."

◆ "Why did the main rotor hit the ground during my landing? I had to make a side flare to keep the tail rotor from hitting the ground."

◆ "I don't think they should have turned the searchlight on us on short final."

◆ "You just don't get the leveling kick from the stinger in these rice paddies that you do on hard surfaced runways."

◆ "The main rotor must have been out of rig. I pulled pitch and flared, but the rpm didn't build like it should have and that's why we fell through."

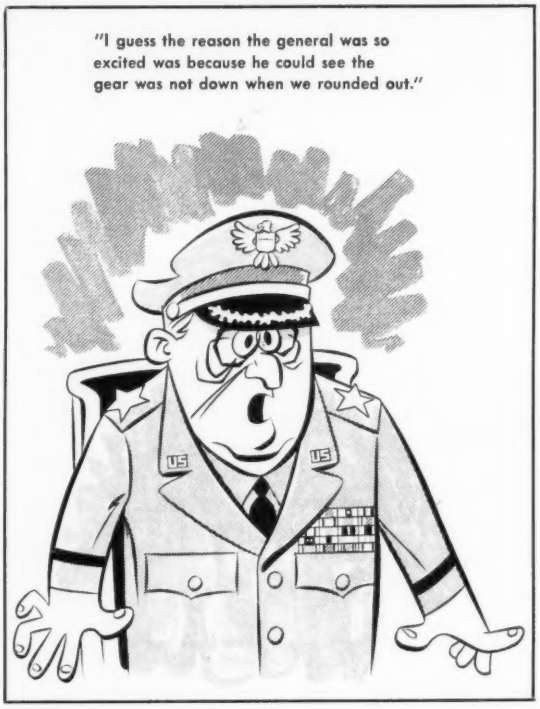
◆ "We were coming in pretty good on short final, about 20 knots and 20 feet. The rpm was stable at about 5800-5900 and I was holding her straight with left pedal. I popped a little collective to clear the concertina wire and that's when I think the tail rotor failed, because we started to do 360s to the right."

◆ "I'm sure I got the collective all the way down. Our altitude? We were at a high hover."

◆ "I didn't want to get a pink slip for making a go-around."

◆ "We got down in pretty good shape and no one was injured in the crash. The gunner? He stepped out to open the pilot's door and fell through the roof of the hootch we landed on."

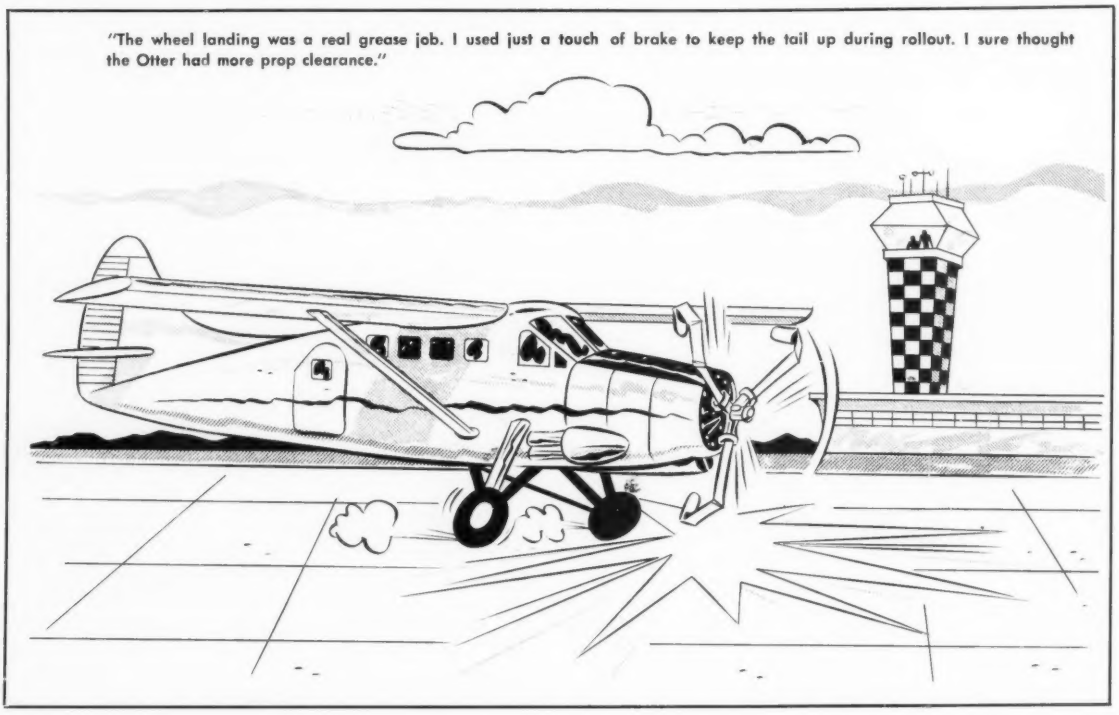
◆ "Yes, the engine failed. We were only about 17 minutes into the fuel warning light when, suddenly, it just quit. Yes, I guess I did get a boost light about the same time. No, I didn't declare an emergency. There really wasn't anything wrong except my low fuel state. If he had let me land straight in, downwind, I would have made it. No, I don't believe it's a violation to land with less than one-half hour of fuel reserve. It's only a violation when you file a flight plan without a proper fuel reserve in the flight plan. Well, yes, I did extend my flight plan en route. You see, I was picking up a good headwind. How many times? I only extended it twice."



◆ "When we couldn't get a radar fix, I jettisoned the slingload to conserve fuel and, later, when we were trying to reach an open area on a hilltop, I shut down No. 2 engine to save fuel. But we still missed it by about 300 meters."

◆ Tower tape: "Army 12345, cleared to land, lane two." Student: "Roger." IP: "Level it, LEVEL IT! I've got . . . I may have let the student go a little too far."

◆ "Coming up, the rpm dropped from 6600 to 6200, so I backed down to a hover to let some of the LRRPs off. When the rpm got down to 5500-


"The wheel landing was a real grease job. I used just a touch of brake to keep the tail up during rollout. I sure thought the Otter had more prop clearance."

5600, the helicopter started to turn. I tried to follow the turn with cyclic, but the main rotor hit some trees. The helicopter then inverted, so we shut everything off and got out."

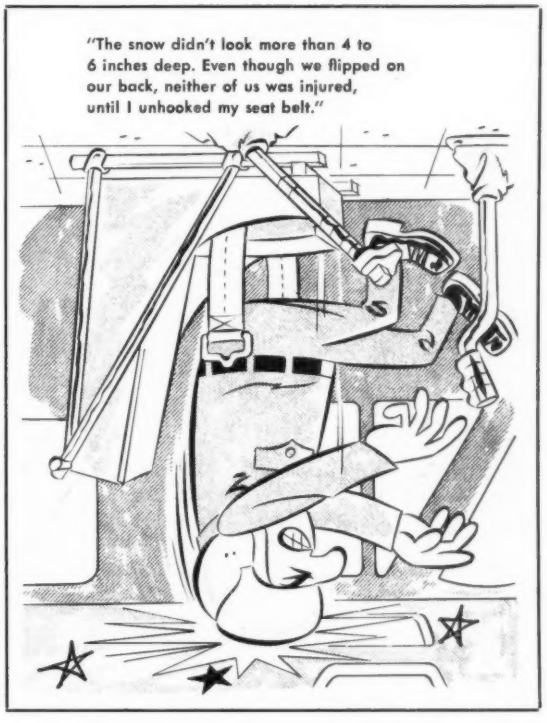
◆ "What we should have done was to land sooner to find out where we were. That way, we might have had enough fuel to get back across the border before we gave out. We still might have damaged the aircraft but at least we wouldn't have gotten them all shook up getting us back."

◆ "The first flare was too high, so I nosed it over to get some air speed back. But we got a high sink rate instead. The second flare was too low, I think. That's probably why the tail rotor failed."

◆ "First, he did an autorotation into this confined area, but the flare was too steep. When he recovered with power, the tail rotor had already come off. With the power he had wrapped on, she just kind of screwed herself into the sky, going around and around. He must have bottomed the pitch at about 50 feet, because here he came again. This time, she was level, but still turning, and hit real hard, breaking off both skids. He caught it with power on the first bounce and started back up again, but the main rotor blades got caught in that big tree. About that time, all control was lost."

◆ "We had to wait awhile for the maintenance people to build up some sand bags to land on. Just on the right side. That's the only skid that was gone. The skid? Well, you see there was this deuce and a half that came over the crest of this hill the same time we did, but in the opposite direction. No, we didn't report a midair. You couldn't have a midair with a truck, could you?" . . . *Or a motor scooter, or a bicycle, or a water buffalo, or a dike, or a hootch?*

◆ "The cause of this accident was gross pilot error by the aircraft commander's inattention to cockpit instrumentation. I was the aircraft commander."


"The snow didn't look more than 4 to 6 inches deep. Even though we flipped on our back, neither of us was injured, until I unhooked my seat belt."

CW3 Robert M. Chambers
Aircraft Accident Review and Analysis Department
USABAAR

The fixed wing takeoff is a relatively simple maneuver . . . or is it?

TAKEOFFS RANK nowhere near the most difficult maneuvers Army fixed wing aviators must master. An IFR approach in minimum weather conditions and a short field approach over a barrier on a hot day require more planning and finesse. Maybe it's a feeling that takeoffs are relatively simple that has lured some aviators into a sense of complacency —a sense that is completely unjustified, as the following examples reveal. Our information for this article was taken from actual case histories and there is no intent to point the finger at any command or individual. Our purpose is to air an obviously flagrant disregard for standing orders and good judgment. Possibly the same condition exists in your unit. Possibly you'll recognize yourself, or someone you know or can influence. If so, and if the same mistakes can be prevented, our effort in writing this and yours in reading it will be well spent.

The flight: A senior commander was conducting an initial orientation and standardization ride for a newly assigned aviator in an OV-1. The new aviator reported to his unit after a 47-day en route delay, with a total of 330 flying hours, 80 of which were in OV-1s. After the normal 3 days of in-processing, the aviator was told to report to the flight line where the commander would start his checkout. After completing a thorough preflight, the commander had the aviator do a walk-around to see just how much he remembered of his recent OV-1 transition. The aviator satisfied the commander about his knowledge of the airplane and they strapped in and fired up the engines, using the dash 10 checklist.

They taxied to the runup area for runway 24. While taxiing, the commander informed the tower they would be making touch-and-go landings. The tower acknowledged and cleared them for takeoff. The airplane made a normal takeoff, turned left and remained in the traffic pattern, south of the field.

Statements from several witnesses developed the following sequence: On the first landing, the airplane was long and hot, touching down about 2,200 feet down the 5,500-foot runway. It became airborne in a shallow climb very near the end of the runway. The landing gear was seen to retract, but the airplane failed to climb. It started to swerve slightly to the left and continued a shallow climb to an altitude of approximately 50 feet. The left wing dipped, as if in a shallow bank, and the airplane started down in a left wing low attitude, disappearing below the trees.

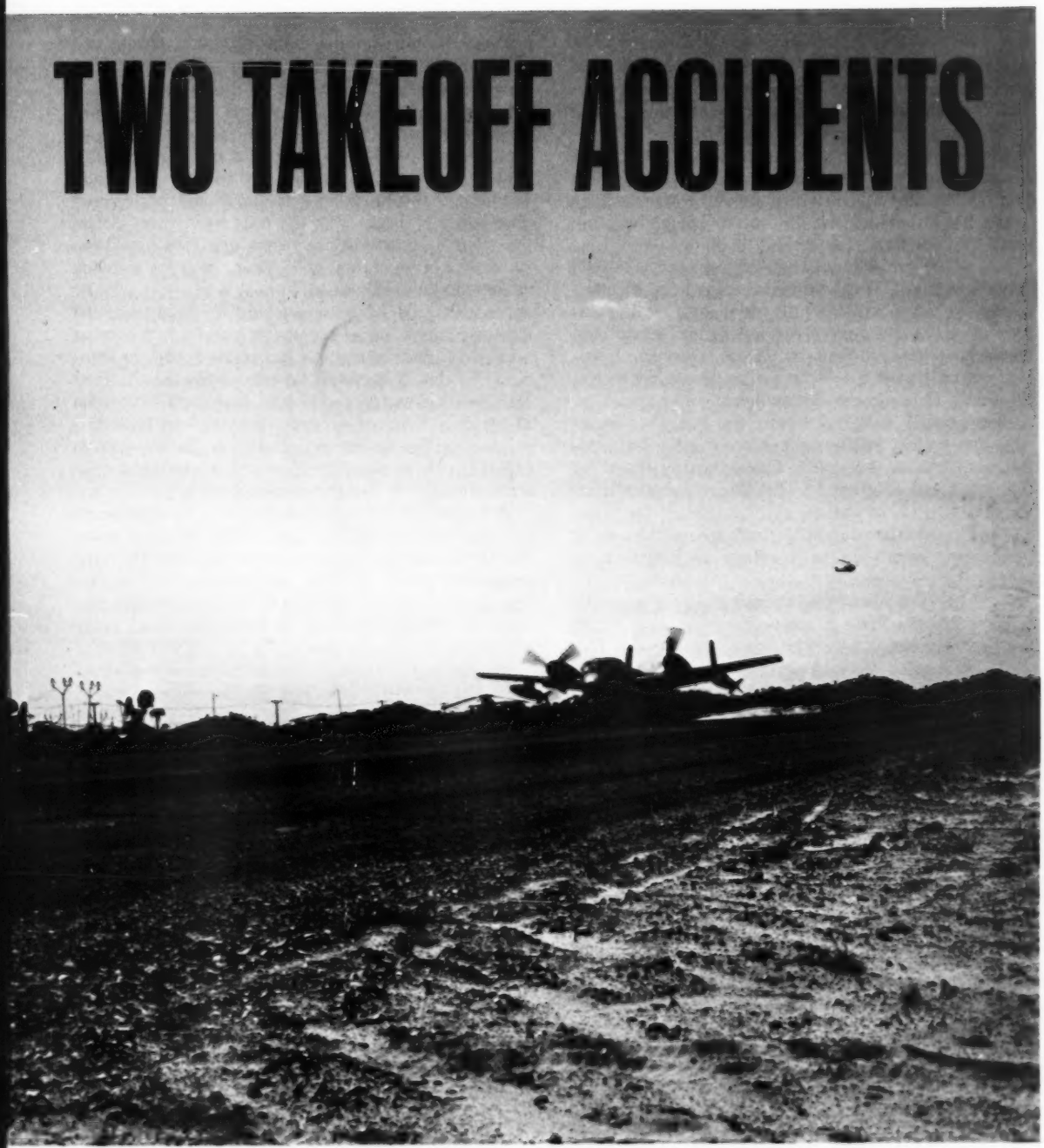
The investigation: An SP4 was the first person to arrive at the crash scene. He stated: "When I arrived, fuel fumes were strong, but there was no fire. I started to walk around the front part of the wreck. About 30 feet in front of it, I found the body of the commander. His APH-5 helmet was about 10 feet further away from the airplane. Since he appeared dead, I started to look for other casualties. Approximately 80 feet in front of the wreckage, I found another APH-5, so I started looking around. Just on the other side of a large bush I found the body of the aviator. The back of his head was all bloody and, about 6 inches from his head, there was a small tree stump with lots of blood on it. I did not touch either of the bodies, as they looked dead."

The crash crew had arrived and foamed the wreckage to prevent any chance of fire. The NCOIC of the crash crew said: "When we arrived, I ordered my crew to foam the wreckage because JP-4 fumes were strong. I then started a survey of the area for witnesses. At this time, the SP4 pointed out the bodies of the crew. The medic checked and found that both were dead. A doctor came up to me and said that he had seen the airplane disappear behind the trees and not reappear. I asked him to look at the crew. After doing so, he told me they were both dead."

Three hours after the crash, the aircraft accident investigation board members arrived at the crash site. During their investigation, it was discovered that all external stores were attached to the airplane at impact. A close inspection of attaching points, pods and drop tanks revealed no evidence of an attempt to jettison the drop tanks or pods prior to impact. The No. 2 engine had full power at impact, while No. 1 had none. The controls indicated the No. 1 engine had been shut down. Analysis of both engines revealed no mechanical reason for either engine to fail.

On checking the APH-5s, it was discovered the aviator's had probably not been on properly. The crew chief of the airplane said he noticed the aviator taxied out with his chin strap hanging down. Close inspection of the helmet revealed no damage (i.e., tearing of the chin strap). The commander's APH-5, found near his body, had the chin strap connector strap broken. It also appeared to be very worn. A statement by a unit officer confirmed the fact that the commander said many times, "This old helmet and I have been together a long time." He also

TWO TAKEOFF ACCIDENTS



said he had no intention of changing it.

The flight surgeon stated in his report that at least one, and probably both, pilots would have lived if their helmets had remained on during the entire crash sequence. While both ejected and got stabilization, the main chutes did not fully deploy. The commander's chute was partially deployed.

The autopsy report stated the aviator could have lived through the ejection and impact, except for his head injury. It was also probable the commander would have survived the injuries to his body if his helmet had remained on.

The ejection: There were no witnesses to the actual ejections. The board determined the ejection sequences were initiated just prior to first impact. Inspection of the seats revealed they functioned properly. The complete sequence occurred. However, there was not sufficient altitude nor air speed to allow full parachute deployment.

The board's analysis: It was the board's conclusion that neither engine failure nor mechanical malfunction caused the crash. Cause factors listed by the board and substantiated by all reviewing officials were:

1. The commander (IP) used poor judgment in performing touch-and-go landings in violation of unit instructor pilot guide.
2. The IP allowed the aircraft to enter a condition outside the flight envelope, from which it could not be recovered.
3. Failure of IP to jettison external stores (full drop tanks).
4. Suspected simulated engine failure by IP at low altitude and air speed, in violation of instructor pilot guide.
5. The IP had marginal experience and used poor judgment in pulling an engine on the pilot at his proficiency level.
6. Failure to recognize the need to eject until too late.

The accident just related is only one of many instances in which disaster accompanied touch-and-go landings. The merits of conducting touch-and-go landings were discussed in the USABAAR Weekly Summary and opinions from aviators in the field were solicited. Two responses were:

Major flight detachment commander and senior Army aviator: "The Army spends a great deal of time and money in standardization and yet the individual instructor pilot seems to think he can accomplish more training in a given period by conducting touch-and-go's. In truth, training suffers. The student is hurried, may err (overboost the engine is nearly common), but standardization suffers most because the post-landing and pretakeoff checks are not emphasized. Do away with touch and-go's!"

Warrant officer, instructor pilot: "When my boss read your comments on touch and go's, he ordered me to conduct full stops for all future training. I thought I'd spend more time transitioning new students and would be wasting my time. It was soon apparent that coming to a full stop and performing after-landing checks was the only way to go. I feel the pilots I transition are better qualified now than when we did touch-and-go's. Thank you for showing me how to be professional."

Another case of *hurry up and die* was recorded when a platoon leader hopped in his O-1 in a combat area and called the tower, "Expedite! Troops in contact!" Within 5 minutes, he was dead. Hostile fire? No. He died within the airport boundary—a victim of his own sense of urgency. No one can fault this aviator for his desire to accomplish the mission as expeditiously as possible. However, by trying to save a few minutes, he set the mission back several hours.

A review of the sequence of events leading up to this accident showed the aviator had flown 9 hours the day before, then spent most of the night checking compound guards. Unlike the previous case history this accident involved a much less complicated machine performing the simple takeoff maneuver. There were no mechanical failures.

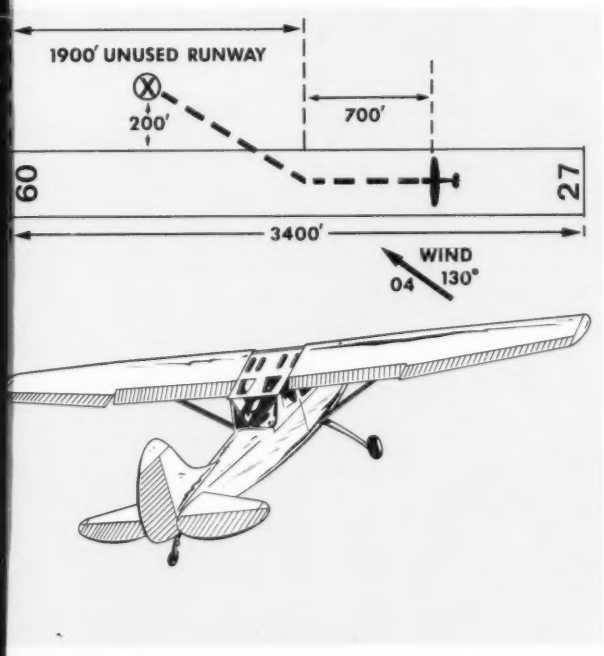
The aviator arrived at the airfield early the morning of the accident to assign various missions to his aviators. As platoon leader, he was known to be very conscientious about assigning flight time so that he and the aviators in his platoon would divide the time as evenly as possible. He then took off on his first mission of the day, without an observer. This mission went well and he had no problem conducting it without an observer. He landed back at homeplate at 1100 and, after a refueling and break time of 1 hour, took off again, this time with an officer observer. Another 3-hour mission went well, but this time he did not quite make his usual smooth landing and he had a little trouble with his directional control. The observer jokingly commented about the curves in the runway. After an hour and a half on the ground, the aviator was ready to take off again, this time with an enlisted observer. This observer had flown with him many times before and expressed his confidence in the aviator's ability to handle the O-1 in any circumstances.

The aviator asked for a runway 27 departure, with

the wind from 130 degrees at 4 knots. The tower approved and cleared him for takeoff. With 2,600 feet of runway in front of him, the aviator made a short field takeoff and broke ground in 700 feet. For some unknown reason, he started a maximum climb and turned 45 degrees to the right. This gave him a direct tailwind. At an altitude of 100 to 125 feet, the airplane went into the first stages of a spin and impacted nose low.

The medical examiner determined that the aviator died instantly. In one way, the observer suffered a worse fate. He did not wear his APH-5. With only a headset for protection, he sustained severe head injuries and will probably never fully recover. Why? *He was having a buddy paint lightning bolts on his APH-5.* Other than head injuries, he had only contusions and abrasions, all minor. In other words, he could have walked away from it.

As for the aviator, his series of errors caught up with him all at once. Ask yourself, "How many times have *I* made the same errors and how close did I come to getting caught?"



The aviator had his APH-5 on, with chin strap snapped. He wore gloves, a Nomex flight suit, etc.—all of the right things, but to no avail. He had flown his airplane outside its design flight envelope and could not rely on it to protect him, as it normally would when flown in its flight envelope.

If the engine quits on takeoff, everyone knows the most logical procedure is to maintain flying speed and land straight ahead. This is repeatedly emphasized to basic students. *Crash under control* is saying the same thing. What makes otherwise intelligent aviators place their aircraft in steep banks at low air speed immediately after takeoff?

The following was published in the USABAAR Weekly Summary for 24-31 July 1970. It is repeated here, not as a full explanation of the forces acting upon airplanes in steep banks at low air speed, but with the hope it will stimulate discussion. "The lift that an airfoil must produce to overcome the weight of the aircraft must at least equal that weight. Those who have gone through flight school can recall seeing L = W. Let's disregard *lift* (L) and concentrate on *weight* (W). The weight of an aircraft can be affected by the forces applied. We're discussing bank angle, so let's consider the effect of the forces applied when you bank the aircraft. In a bank, the aerodynamic forces, in essence, increase the weight. For example, a bank angle of 60 degrees imposes 2 g on the aircraft, increasing the weight twofold. In that the aircraft now weighs twice as much and L must equal W, then L must also somehow double or the aircraft must decelerate or descend (neither of which can be easily sacrificed just after takeoff!).

"The point of all this? Well, we wonder if that young aviator knew what he was doing when he, '. . .was seen to bank his aircraft immediately after takeoff?' We think he may have had a vague recognition of the facts. We think he may have been observed doing the same thing in the past, with only one difference: He got away with it! We think all aviation supervisors who know *WHAT* can happen and *WHY* are duty bound to relay the facts to their subordinates. We think the real crime is committed when they don't."

These are only two of the many accidents occurring during takeoff. Many involve materiel failure of some kind. We ask you to remember that if you have your aircraft outside its flight envelope at the time of failure, you are stacking the cards against yourself. Treat every takeoff with the attention and control demanded to remain in the design flight envelope.

UNDERGROSS, BUT OVERGROSS

The main object of this article isn't to make you ask questions about this accident, but to make you ask yourself many questions about your allowable payload

Lieutenant Colonel John J. Miller
Data Center
USABAAR

HOW CAN THAT BE? We have forms, charts, slip sticks, performance checks and knowledge to determine if our flying machines will fly within design limitations of weight and balance. So the question is how can we ever find ourselves in an undergross, but overgross situation? Let's take a look at a catastrophic accident in which there were 39 fatalities, two personnel with major injuries, 26 personnel with minor injuries and 16 personnel with no injuries.

Most readers will say, "Ah, hah, I've got you now. The Army doesn't have an aircraft that will carry that many personnel and still be in an undergross configuration." But let's take a look at some of the pertinent points extracted from the accident. First, a glance at this DD Form 365F extract:

Allowable Gross Weight Takeoff and Landing	Aircraft Involved	Margin
33,000 pounds	32,499 pounds	501 pounds

Permissible cg		Aircraft Involved		Margin	
Takeoff	Landing	Takeoff	Landing	Takeoff	Landing
322″ to 337″	323″ to 342″	324″	324″	2″	1″

Nothing wrong, so far. All figures are in the green. But let's go further into the 365F and see what made up the weight of 32,499 pounds:

Basic aircraft:	18,841 pounds
Oil (3.7 gal):	28 pounds
Crew (5):	920 pounds*
Emergency equipment:	100 pounds
Extra equipment:	120 pounds
Takeoff fuel (307 gal):	2,000 pounds
	22,009 total aircraft weight

Compartment	Passengers Number	Weight
C	5	1,000 pounds
C	21**	2,730 pounds
D	26**	3,380 pounds
E	26**	3,380 pounds
		10,490 total payload

	10,490 total payload
	+22,009 aircraft weight
Total:	32,499 pounds takeoff weight

*A little on the light side for crew weight.
**130 pounds each is also a little on the low side for combat troops, even if they are allied troops.

This total weight is within limits, with 501 pounds to go before we reach maximum allowable gross weight. But there's a clue to what may be a problem area. Go back to the payload, add up the number of personnel on board and add five crew members to your total. This makes a total of 83 people on board. So what? If there are seats and seat belts for 83 personnel, why not load 83 passengers? The big problem here is that the helicopter we're talking about is a CH-47A.

Now, let's extract some key portions of statements from the personnel involved.

Aircraft commander: "I contacted the ground coordinator as well as the commander of the airlift company to receive a mission briefing. The ground coordinator asked how many troops I could carry. I said up to 65. He said I was supposed to be used after the two lifts were on the ground in the LZ. The airlift company commander asked if I had any objections to going in behind the first lift. I said, 'No.'

If there are seats and seat belts for 83 personnel, why not load 83 passengers?

"There was a discussion between the ground coordinator and the airlift commander about whether I should be used behind the first lift. I said that I was going to be up and the airlift commander could give me instructions over the radio. We started at approximately 1210 and departed the airstrip. I called the airlift commander and told him I was up.

"We circled south, waiting for instructions, for about 40 minutes. I finally decided to go down and land at the pickup zone. I told the flight engineer to keep the ramp up, since it looked like there was going to be a further delay. We sat there for awhile and I called the ground coordinator and asked how much longer it would be before we could take off with our first load. He said about 10 minutes. During this period, another Chinook came in and landed in front of me to take on a load. I told the ground coordinator to go ahead and load my aircraft. There was a group to my front which started heading toward us. I instructed the flight engineer to make sure he counted them as they got aboard and not to take more than 65 passengers. As soon as we were loaded the flight engineer called, 'Ramp's up. We have 65 passengers.'

"I picked up to an 8- to 10-foot hover and checked the power setting, which was approximately 650 pounds of torque. I noted that all other instruments were in the green. I then asked the crew chief and gunner if we were clear and told them to check for any aircraft coming in on the strip. I looked at a flag about 100 yards to my left front and it looked like the wind was about 10-20 degrees off to the right of the nose. I applied forward cyclic and added about 80 pounds of torque to get the aircraft moving in an easterly direction.

"We went through translational lift, gained air speed and were approaching about 30-40 knots indicated. I was holding about 760 pounds of torque and everything looked normal. All of a sudden, the No. 2 torque needle fell off to about 450 pounds and vibrated. At the same time, the No. 1 torque jumped to 800 pounds and the rotor rpm dropped to 210. I lowered the thrust control slightly to conserve rpm. We were about 30 feet above the ground. I thought for a second of trying to get the aircraft on the ground, but decided there was not enough room to get stopped before we reached the edge of the dropoff. I elected to fly the aircraft through, hoping to reach the lower terrain which would enable me to lower the thrust and get the rotor rpm back.

"The pilot said he had full rpm beep, which I knew, since I had my fingers on the beep button also. The rotor rpm started decaying and we were losing altitude as we approached the edge of the dropoff. We were descending into a powerline and I eased back on the cyclic to gain enough altitude to clear it. We had reached the edge of the dropoff and I thought we had made it. Rotor rpm was below 200. I lowered the thrust a little bit more and it sounded like the engines were gaining rpm. I looked at the rotor tachometer and saw the rotor rpm drop off further. At the same time, the nose pitched up and to the left. The aircraft was going out of control. We fell through and came to rest on the side of a steep slope."

Pilot: "At approximately 1335, after orbiting over the PZ for half an hour, the AC called our ground contact and the contact said they were ready to load. The AC directed the ground people to load 65 passengers.

"The personnel came from the left and right and loaded rather quickly. The crew member at the ramp was advised to allow only 65 personnel on board. After the aircraft was loaded, he was asked how many were on board and his answer was 65.

"The aircraft was readied for flight and, with the AC at the controls, came to a hover. The aircraft hovered at 650 pounds of torque, plus or minus 20. The AC asked the crew chief if the flight of UH-1s was in the area. The answer was no. We were, at this time, stabilized at 10 feet, in a hover, with 2,000 pounds of fuel on board. We began to move forward. We had gone approximately 150 feet, at an air speed of 20 knots, when I noticed a drop in rpm. I immediately began beeping up No. 1 and No. 2.

"The rpm continued to drop. By the time we had gone 300 feet and had an air speed of 35 knots, the rpm was down to 220 and still dropping. I then noticed the torque needles. One needle was at 800 pounds and the other was at 650 pounds or less. I believe No. 1 was the high needle, as I continued to beep up No. 1 and No. 2. If No. 1 had been low, I would have beeped No. 1 alone. I'm not sure of this.

"I never did hit the emergency beep, as it happened too quickly. We were about 150 feet from the edge of the cliff, at 35 knots, with about 210 rpm,

when I saw a set of wires at the edge of the cliff. I alerted the aircraft commander about the wires. We did a slight flare to avoid the wires. Then, I remember hearing a loud flapping sound from the blades. I saw the ground go by for perhaps 8 seconds. I locked my seat harness and attempted to bend the emergency exit latch. The aircraft came to rest and I immediately exited."

Right door gunner: "The aircraft picked up to a hover normally. But, as forward motion was attempted, it sank to within 5 to 10 feet of the ground, blowing sand into the ship. A slow recovery was achieved, but a falling through, or apparent mushing, occurred. The ship was in a normal nose high attitude. We seemed to be heading for a hard landing on a level unprepared field. Another recovery, with an apparent loss of rotor rpm, pulled us forward and over a powerline. The aft gear pulled the line until at least one pole was pulled out, then we were over the cliff. The ship turned to the left in a descent, but the nose seemed to rotate downward. The subsequent impact appeared to be one sustained jolt, rather than cartwheeling of any sort."

Passenger: "At approximately 1300, I was boarding a Chinook. When it was my turn, I said to the officer standing next to me that it was too crowded. When I said that, I was standing on the back door. They put about four to six others on the door and raised it for takeoff.

"I remember, just before we took off, that the rotors sounded like they had a heavy strain. We hovered for a short second, then started off. Just before we reached the ridge, I saw we were losing altitude and then noticed the pilots yelling at each other. All of a sudden, the tail end felt like it went up and then it started falling. The tail end hit first and skidded for a few seconds. The man operating the rear door couldn't let it down. If he had, he would have killed about 10 people."

Ground battalion S-3: "At approximately 1145, I briefed a warrant officer who identified himself as the pilot of a CH-47A. The briefing dealt with his participation in a personnel insertion to a secure LZ. During the course of the briefing, I questioned the pilot about the ACL of his Chinook and he replied, '65.' I informed him he could carry less if he desired as there was sufficient time to do so. He replied that he had carried an ACL of 65 on an earlier mission. He further stated he would linger at the LZ after refueling, then move to the PZ at approximately 1300."

Teardown analysis report: Summary and conclusions:

a. It has been established through laboratory analysis that both engines were operating on a leaded fuel, probably AVGAS 115/145.

b. T55-L-7B engine, S/N xxxx:

(1) Disassembly and inspection of this engine revealed that it probably operated in the maximum power range just prior to impact.

(2) There was no evidence of an internal failure. There was no rotational damage to the compressor or the turbine.

c. T55-L-7B engine, S/N xxxx:

(1) Disassembly and inspection of this engine revealed it was operating in a range of 200 to 500 foot pounds torque, with a turbine inlet temperature of from 1200° F to 1450° F just prior to impact.

(2) This engine was probably in a coast-down condition at impact. Heavy soot deposits on the turbines and nozzles support this theory.

(3) There was no evidence of an internal failure. There was no rotational damage to the compressor or turbine assemblies.

d. Disassembly and inspection of the forward transmission revealed this transmission was in excellent condition. There was no evidence of sudden stoppage or impact marks to indicate this transmission was not turning prior to impact.

e. Disassembly and inspection of the aft transmission revealed, through microscopic inspection, that there was no evidence of sudden stoppage or impact marks on any of the gears or bearings that were not destroyed by heat or fire. The physical condition of this transmission makes it impossible to confirm that it was turning just prior to impact.

I grant you there's much more information in the accident report than the little we have extracted for your review. Many of you will ask, "Is this a game of 20 questions?"

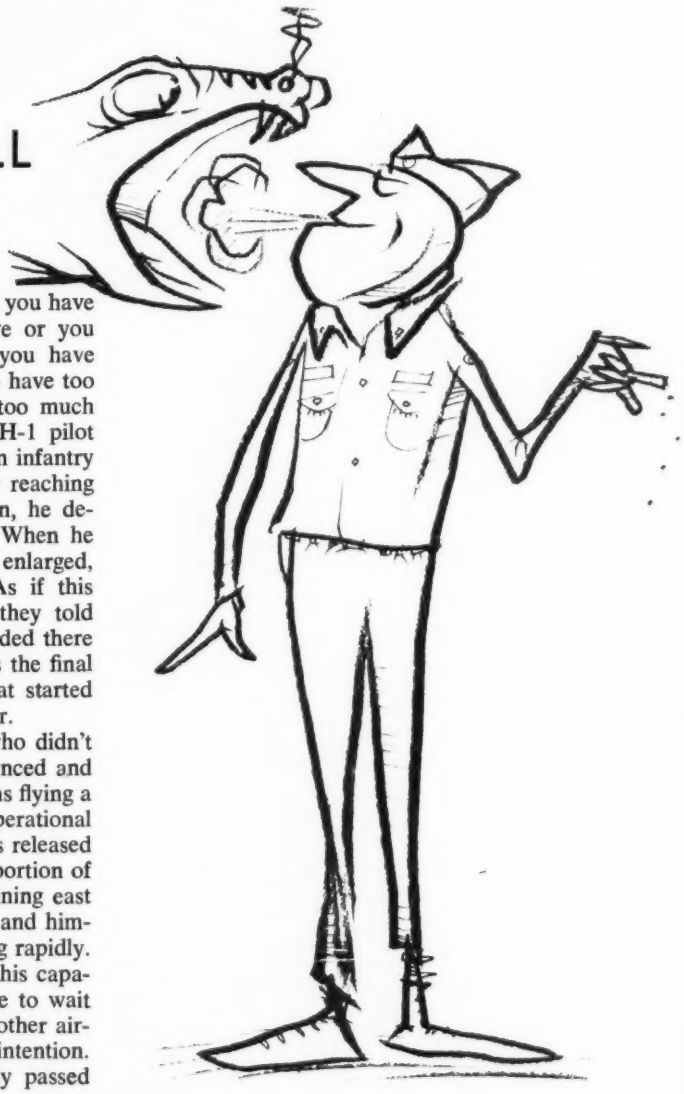
The main object of this article isn't to make you ask questions about this accident, but to make you ask yourself many questions about your allowable payload, to ensure that you, your crew and passengers never find yourselves in an aircraft that is UNDERGROSS, BUT OVERGROSS.

SHORT SHORTS

The following short articles were written by aviators engaged in reviewing accident and other mishap reports for the USABAAR Data Center. They urge you to learn the lessons they have selected from the unfortunate experiences contained in these reports

PRIDE CAN KILL

CW2 Ronald Diller



THE QUESTION IS not whether or not you have pride in your flying ability. You have or you wouldn't be flying. The question is, do you have *too much?* Some may say it's impossible to have too much pride. Experience has proven that too much pride can kill you. Take the case of a UH-1 pilot who was assigned a resupply mission for an infantry unit located in triple canopy jungle. After reaching the landing zone and making a high recon, he determined it was too tight and unsuitable. When he told the ground unit the area had to be enlarged, they questioned his ability to make it. As if this wasn't a big enough blow to his pride, they told him a helicopter from another unit had landed there the day before with no problems. This was the final blow to his ego and pride took over. What started as a wise and safe decision ended in disaster.

Next, let's take the case of an aviator who didn't like to fly at night, was relatively inexperienced and had never flown in marginal weather. He was flying a mission in the northern portion of his operational area. He had flown about 12 hours and was released to return to his home base in the southern portion of the area. It was dark and a squall line running east to west had developed between home base and himself. The visibility and ceiling were dropping rapidly. He realized this situation was well beyond his capability and decided to stop at a nearby base to wait out the weather. En route, he contacted another aircraft from his unit to advise the crew of his intention. The other crew told him they had already passed

through the squall line. Then they started to needle him about why he couldn't do the same. Pride took over and the results were inevitable.

Both aviators started with wise decisions, but let their pride change these decisions into disasters. Only *you* know your own capabilities and only *you* can swallow your pride and make safe decisions. Aviators have every right to be proud of their skills. They must also have the mature judgment to control their pride and perform within their skills.

PRECAUTIONARY LANDING PHOBIA

CW2 James M. King

USABAAR RECEIVES many crash facts messages concerning accidents in which pilots could have made precautionary landings, but didn't. Why? I'm sure every aviator who has served a tour in RVN knows several reasons, some he wouldn't admit. The

most obvious reason is illustrated by the aircraft commander who would rather land his sick ship at the nearest secure location. This is understandable. But what about the guy who extends his flight for the comforts of home base and has a complete failure en route? These are the people we need to worry about.

An example is a pilot whose UH-1H lost engine rpm down to 5200, forcing him to enter autorotation. His engine rpm returned and he made a power approach to the ground. Once on the ground, he decided that, since his engine was still running, he could make it one more mile to an airfield. En route, he had a complete engine failure, resulting in an accident.

In another case, an OH-6 was not developing full power so the pilot put it down to determine the cause. While performing a hover check, he decided the engine was performing normally. Instead of having maintenance inspect the helicopter, he attempted to continue his mission and the engine failed at 100 feet during takeoff. The resultant crash cost two lives.

Why did these pilots elect to continue flight rather than stay on the ground? Excess emphasis on completing missions, regardless of circumstances, could well be one reason. Another is the fear that if maintenance is called out to a location, they will find it was only a gauge, or the maintenance officer may elect to fly it back for the pilot. Is a maintenance officer more qualified to fly a substandard aircraft? No! Just because you're a maintenance officer, it doesn't mean it's your job to fly an aircraft with even a *suspected* malfunction. A Crane, CH-47 or ground handling wheels can do a much better and safer job.

An extreme example of bad judgment on the part of a maintenance officer is illustrated by the following accident. An aircraft commander had determined his helicopter was unflyable due to an increase in egt whenever power was applied. Black smoke was seen pouring from the tailpipe, oil vents and particle separator. The unit maintenance officer made a 15-minute runup, with the same indications of malfunction. *He then elected to fly to the company maintenance area.* As he performed a downwind, near maximum performance takeoff, black smoke was seen pouring from the tailpipe and the engine failed. The helicopter rolled and slid 280 feet down a railroad track.

The exact reason pilots fly, knowing something is malfunctioning, can only be told by the pilots involved. Obviously, accidents that result are needless, senseless and preventable. At any indication of trouble, don't be afraid to put it down. Pride, mission completion or the comforts of home base are not worth putting the lives of crew and passengers in jeopardy!

MISUSE

CW2 Michael Wilcox

PROBABLY THE greatest misuse of aircraft comes from us—the aviators. Low level flying when it's not necessary to accomplish our missions and stressing aircraft beyond design limitations by performing aerobatics are only two examples of misuse which can and do lead to catastrophic accidents.

The use of a ship to accomplish a mission for which it wasn't designed is another example. When you use a command and control ship to get down

and LOH around, this not only puts the ship outside its design flight envelope, it also puts it below the altitude to which it was assigned and in the way of other aircraft designed to do the job. This increases the likelihood of midair collisions.

Dustoff is a vital part of any operation and one of the most misused of our aviation assets. How many

times have you heard of an emergency dustoff being radioed in and, when the ship got out to the area, the crew discovered their patient had sprained an ankle or cut a finger? In most instances, dustoff gets a fire team for cover, causing three ships and crews to spend useless hours when this occurs. But that's not the worst part. Perhaps, somewhere else, there was a man dying and in need of the medevac on the way to the sprained ankle or cut finger.

If misuse could be eliminated, our accident rate could be vastly improved. You can help!

ENLISTED EYES

CW2 Richard F. Sherman, Jr.

"YOU'RE CLEAR of the tree, sir. Start coming down."
"O.K., bring the tail left."
"Hold it there."
"Bring the aircraft left."
"Clear to come left."
"Clear down on the right."

If you've ever spent a tour in RVN as a UH-1 slick pilot, this sequence should be very familiar. If you're en route, you'll soon hear this valuable service rendered by our *enlisted eyes,* two men skillfully clearing a $250,000 helicopter into an LZ no larger than the helicopter itself.

Have you ever stopped to consider how many accidents these four eyes have prevented? The next time you hear, "Bring the tail up," think about it. Sometimes, it seems all we can remember is the times we weren't cleared properly. But how many times have we thanked those two guys for a job well done? How many times have they prevented tail rotors from being used as buzz saws or back hoes? How many stumps have been avoided because one of the enlisted crew said, "Hold it!"? It is about time aviators give credit to the men in the gunners' wells who protect the men at the controls.

As we sit up front, we think to ourselves, "How easy those two have it back there." Not so! Their job is long and tedious. Riding many hours, day after day, their real moments come on short final into tight LZs. Here, they can well mean the difference between a successful mission and disaster. These men in the wells are your guards and eyes.

Once in the LZ, they supervise loading and unloading. If properly trained, they can assure the load will be adequate, but not excessive. Many times they are the only persons available for unloading, due to the lack of a suitable landing spot. When the situation arises, they are always up to the task.

Imagine placing yourself and all your trust in the skill of another. They do it daily, where one erroneous control movement could turn into a wild ride, ending in the sound of crushing metal and the sight of billowing smoke. Be precise, develop your pilot technique and listen to your crew so this trust will grow and your flying will be safe and efficient. You are their first concern in times of emergency. Let their safety be your concern throughout each mission.

All this your *enlisted eyes* do is secondary to the maintenance of your helicopter which keeps them working long after your job is done. Our gratitude should be directed toward their diligence and the fine job they do. Thanks to our *enlisted eyes* for a job well done!

SHORT SHORTS

HIGH ALTITUDE AUTOROTATIONS

CW2 Frank Shafer

THE THOUGHT OF high altitude autorotations is comforting, at first, with a suitable landing area practically assured. Way up there in the sky, it's no problem to choose from all the many inviting places below. This contemplation becomes somewhat frantic when, at a lower altitude, your garden of roses turns into a patch of thorns.

At high altitudes in good visibility, the terrain tells us about itself by various coloration and the shadows of its features. We know dark colors are usually trees or thick shrubbery, to be avoided. Light areas are less hostile, probably containing some form of grass or sod. To this, we add all the myriad of features that occur—slopes, stumps, wires, rocks, fences, etc.

During an emergency autorotation from an altitude of 4,000 to 5,000 feet agl, everything seems to be going for us. We have time to perform all the necessary emergency procedures. Primary on our list is an adequate landing area. We make the decision to commit our landing to a certain area and the general terrain is such that there are several areas accessible, even from a lower altitude, with proper autorotative techniques. We find, upon reaching our area, that it's not the most suitable of several that were available. At this point, we have no choice but to accept the stumps, the slope that turned out too steep or the fence partially hidden by high grass. This makes it reasonable to insert another step in our sequence to assure success.

If we choose a point or an object with suitable areas in close proximity, mentally noting that we must make a decision about which area we are committing ourselves at a certain altitude, we are, in effect, performing a low recon of the forced landing areas at an altitude where the features are more definite and apparent, still leaving ourselves the ability to choose the most suitable area for landing. Choosing this point or object puts us in a position to alter the autorotation within operational limits, ensuring the landing area will be accessible. In this way, we are not committing our landing to a specific area that may turn out to be unsuitable at a position where we can't alter the maneuver to meet the conditions.

Shooting our approach to this point or object also leaves us with an escape. There's always a chance that our high altitude autorotation may be deficient in some way relative to the landing area. Using the point and a reasonable lower altitude, we may alter the maneuver to the most suitable landing area. The forced landing maneuver is taught at lower altitudes of 1,000 to 1,500 feet agl. When this altitude is reached in the real thing, we have a *key* to adjust the final portion of the maneuver to a successful landing area.

With helicopter operations moving to higher altitudes, adjustments must be made. Planning and judgment before the fact are the ingredients we need for success.

SFC Duke E. Fletcher
Aircraft Accident Review & Analysis Department, USABAAR

maintenance PIGEON

ALONG WITH THE great expansion of Army aviation in recent years have come far more complicated aircraft and equipment, creating a demand for more intensive and minute inspections of aircraft and associated maintenance. Because of the critical nature of aircraft maintenance, there's a great need for safety doublechecks. The men who provide our doublechecks are called aircraft technical inspectors (TIs).

The individual assigned as a TI has many responsibilities. We rely on his judgment, training and knowledge of our aircraft to determine if they are safe to fly. Without adequate safety precautions in our business of military aviation, we all know our lives wouldn't be worth two cents. When maintenance is performed and the TI approves it, it's understood he is responsible. Is he a *PIGEON?* He is, but not in the normal sense of the word. In this case, *PIGEON* stands for Pride, Integrity, Guts, Enthusiasm, 'onesty and 'nowledge.

A TI must have Pride. He must want to be known as the key man in maintaining the best aircraft in the group. How does he go about this? Only by reading, reviewing and knowing his manuals to the last word and the aircraft to the last rivet. His pride extends deeper than maintenance alone. It's reflected by his military bearing, attitude and his desire to protect his buddies.

Integrity—Our TI must have integrity. He must know right from wrong in maintenance and, regardless of obstacles, he must strive for perfection.

Guts—The TI is a professional in every sense of the word. As such, he must stand by his convictions. If maintenance isn't perfect, he must red X it and stand by his opinion, regardless of thoughts, feelings, suggestions of others or roars from his superiors. It goes without saying that the TI must have the professional and moral support of his boss—the aviation unit commander. Without this support, he cannot accomplish his mission.

Enthusiasm—A TI must be enthusiastic. He should let his enthusiasm for work be so well known to maintenance personnel that they will gladly seek his advice and counsel. A wrong attitude and outlook by the TI will tend to make the maintenance personnel keep their problems to themselves.

'onesty—A TI must be honest with himself, his friends, his service and his country. By being honest, he won't let slipshod maintenance get his stamp of approval. This stamp is a mark of authority that must always be held in the highest esteem.

'nowledge—A TI should forever seek to obtain more knowledge to improve himself and his ability to do his job the way it must be done. While performing his inspection duties, he will be busy and the inspections will be time-consuming, but he should allot the necessary time to read and review all applicable publications. The greater his knowledge, the safer our aviation program.

TIs are not supermen. In a sense, they're our policemen to ensure that maintenance personnel do their work right. TM 55-411, Maintenance Quality Control and Technical Inspection Guide for Army Aircraft, Chapter 2, paragraph 3, states: "Safety in aviation cannot exist without maintenance quality control." This truth must be recognized by everyone in the Army aviation program.

The life of a TI isn't all sitting in an office, drinking coffee and exercising his authority. A good TI puts in long hours and he's often at odds with operational personnel who want their aircraft in the air regardless of maintenance conditions—often under the guise of mission requirements. Unit commanders and maintenance officers must give their TIs responsibility, authority and their full backing. They must have this to perform as true professionals.

TM 55-411, Section II, paragraph 5, states: "In no event are quality standards sacrificed solely to increase production." This can also be interpreted to mean, "In no event will quality standards be sacrificed solely to increase availability." Support your TIs when they demand top quality maintenance. If they're real maintenance *PIGEONS,* they're your best insurance for top quality performance and safety.

USAASO Sez

The U. S. Army Aeronautical Service Office discusses

Midairs

Air controllers' preoccupations

Distribution of sectional charts and FARs

Another Near-Miss: (Reprinted with the permission of the Flight Safety Foundation, Accident Prevention Bulletin 70-5) "Another jet pilot friend of FSF reported the following, causing one to ponder airmen's complete and inexorable reliance on radar. Here's his story in our words. Upon departing south out of a high-density airport, the jet flight had been cleared to 6,000 feet. The flight was on departure control frequency and was level at 6,000. The crew then spotted a recip, thought to be military, also at 6,000 and crossing the jet's flight path from left to right. The jet pilot called departure control and inquired if radar had the recip on the scope. The answer was 'No!' At about this time the recip started a turn into the jet, whereupon the jet executed an evasive maneuver to the right to avoid a mid-air. In the opinion of the jet pilot, the crew of the recip never did see him.

"This report raises two interesting points, i.e., how can a radar scope paint a return from one aircraft and not the other when both are in relatively close proximity and, secondly, just because you are on an IFR clearance and ATC has you on the scope, don't think you are 'fat.' Obviously, the system is not foolproof. Consequently, when arriving or departing from *any* airport, all available eyeballs should be looking out the cockpit windows. Make it SOP."

Army 71463, Cleared To Land: To aviators those words should mean that the controller has made certain that there is nothing on or close to the runway which would be hazardous to the landing aircraft. The pilot deserves a feeling of complete security in order that he may devote his full time and attention to placing the aircraft safely on the landing area. Would aviators feel so secure if they suspected that the controller had failed to turn his attention away from an activity entirely unrelated to the primary business of air traffic control? Aviators and a majority of controllers would say that such a thing does not happen. Does it?

Controllers place their careers in jeopardy by preoccupation with such things as playing cards, bull sessions, reading, etc., while on duty as air traffic controllers. Officer and enlisted supervisory personnel at Army air traffic control facilities must protect themselves and the Army by ensuring, through frequent checks and investigations, that controllers apply their undivided attention to the business of controlling air traffic.

Attention Operations Personnel: *Sectional charts.* USAASO receives numerous requests unnecessarily for sectional charts. Dates of latest editions are printed monthly in the Army Aviation Flight Information Bulletin. Procedures for requisitioning charts and publications by U. S. Army and Army National Guard aviation units are located in AR 95-14, chapter 2, page 2-1, and the DOD Aeronautical Chart Catalog, section II, page 11. Automatic distribution is *not* maintained, and distribution of maps and charts will be made by Commanding General; U. S. Army Topographic Command, ATTN: Code 16230; 6500 Brooks Lane; Washington, D. C. 20315.

Federal Aviation Regulations. FAR Volume VI is issued automatically along with the FLIP planning documents. Other FARs can be purchased in a similar volume system. However, until a FAR is grouped into its respective volume, the present system of obtaining the FAR and changes thereto will remain in effect. Other information may be obtained by contacting USAASO or the appropriate overseas USAASO detachment.

Trade Exposure For Experience

Happiness is 4 hours spent chasing fleecy white clouds in the timeless, limitless blue. If 4 hours per month is all the time you have, then you can't afford to spend it unprofessionally. Preplan your flight to obtain the greatest benefit in the time available

Why Won't You Take Us Home?

Pierce Wiggin

Said a young Army pilot named Bortes,
As he sat on a dike in the mud,
To his chopper, a bit out of sorts,
We've flown over hills, jungles and crud,
But we're here on the ground,
With Charlie all around,
Why won't you take us home?

When your rpm started dropping,
The collective went to the floor,
High egt and bleed bands popping,
Said you ain't gonna fly no more,
Now we're here on the ground,
With Charlie all around,
Why won't you take us home?

Your compressor's had it with FOD,
Your tailpipe's hot and burning,
Your skids are glued to the sod,
Your rotors no longer turning,
And we're here on the ground,
With Charlie all around,
Why won't you take us home?

You've had the best of attention,
You've had the best of care,
Groomed by-the-book, not to mention,
The checklist I've used, I swear!
But we're here on the ground,
With Charlie all around,
Why won't you take us home?

Overloaded, you've never flown,
Your health was our first concern,
Bad treatment, you've never known,
Your support, your crew has earned,
But we're here on the ground,
With Charlie all around,
Why won't you take us home?

No cowboy takeoffs for you,
No revetment rotor strikes,
No strain in the way we flew,
True to your wants and likes,
But we're here on the ground,
With Charlie all around,
Why won't you take us home?

There's your frustrated crew chief,
Despondent, it's plain to see,
Only you could come to his relief,
And help us all to flee,
But we're here on the ground,
With Charlie all around,
Why won't you take us home?

Your logbook reads November,
About this, I'd like to speak,
Here it's almost December,
We're due to rotate next week,
But we're here on the ground,
With Charlie all around,
Why won't you take us home?

Hey, the copilot's getting a noise,
From our emergency radio!
It must be the Dustoff boys,
Coming to help us go,
But we're here on the ground,
With Charlie all around,
Why won't you take us home?

So long, old pal of many hours,
We hate to leave you alone,
Your time ran out before ours,
And we're on our way back home!
We're off the ground, all hale and sound!
We'll remember you by our Christmas tree,
Your copilot, crew chief and me!